Exhibit 6: Test Report

TEST REPORT FROM:

COMMUNICATION CERTIFICATION LABORATORY
1940 W. Alexander Street
Salt Lake City, Utah
84119-2039

Type of Report: Class II Permissive Change

TEST OF: MDW9031

FCC ID: AS5LTIMDW9F

To FCC PART 15.247, Subpart C

Test Report Serial No: 73-6591

Applicant:

Lucent Technologies, Inc.
600 Mountain Avenue
Murray Hill, NJ 07974

Date(s) of Test: October 29 – November 3, 1998

Issue Date: November 10, 1998

Equipment Receipt Date: October 15, 1998

CERTIFICATION OF ENGINEERING REPORT

This report has been prepared by Communication Certification Laboratory to determine compliance of the device described below with the requirements of FCC PART 15.247, Subpart C. This report may be reproduced in full, partial reproduction may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

- Applicant: Lucent Technologies, Inc.
- Manufacturer: Lucent Technologies, Inc.
- Brand Name: Trans Talk
- Model Number: MDW9031
- FCC ID: AS5LTIMDW9F

On this 10th day of November 1998, I, individually, and for Communication Certification Laboratory, certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

COMMUNICATION CERTIFICATION LABORATORY

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Checked by: Roger J. Midgley
EMC Engineering Manager

____
Tested by: Kirk P. Thomas
EMC Technician

SECTION 1. CLIENT INFORMATION AND RESPONSIBLE PARTY:

1.1 Client Information:

Company Name: Lucent Technologies, Inc.
600 Mountain Avenue
Murray Hill, NJ 07974

Contact Name: Irwin Buck
Title: Member – Technical Staff

SECTION 2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of EUT:

Trade Name:	Trans Talk
Model Name or Number:	MDW9031
Serial Number:	98SP43528360
Options Fitted:	None
Country of Manufacture:	U.S.A.

2.2 Description of EUT:

See theory of operation (Exhibit 12). This report covers the transmitter only the receiver is covered under a separate verification report.

2.3 Modification Incorporated/Special Accessories on EUT:

The Y500 oscillator circuit was modified from the previously certified unit (Granted March 6, 1998). A description of this change is enclosed in Exhibit 12.

2.4 EUT and Support Equipment:

The FCC ID numbers for all the EUT and support equipment used during the test (including inserted cards) are listed below:

Brand Name Model Number Serial No.	FCC ID Number	Description	Name of Interface Ports/Interface Cables
BN: Trans Talk MN: MDW9031 SN: 98SP43528360	AS5LTIMDW9F	Base Station and Handset (EUT's)	N/A

SECTION 3. TEST SPECIFICATION, METHODS & PROCEDURES

3.1 Test Specification:

Title: FCC PART 15.247, Subpart C (47 CFR 15).

Limits and methods of measurement of radio interference characteristics of radio frequency devices. Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

Purpose of Test: The tests were performed to demonstrate Initial compliance.

3.2 Methods & Procedures:

3.2.1 § 15.247

(a) Operation under the provisions of this section is limited to frequency hopping and direct sequence spread spectrum intentional radiators that comply with the following provisions:

(1) Frequency hoping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system-hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitting signals.

(i) Frequency hopping systems operating in the 902 - 928 MHz band shall use at least 50 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

(ii) Frequency hopping systems operating in the 2400 – 2483.5 MHz and the 5725 – 5850 MHz bands shall use at least 75 hopping frequencies. The maximum allowed 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

(2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

(b) The maximum peak output power of the transmitter shall not exceed 1 watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) In any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in § 15.209 (a), whichever results in the lesser attenuation. All other emissions outside these bands shall not exceed the general radiated emission limits specified in § 15.209 (a).

(d) For direct sequence system, the transmitted power density averaged over any 1 second interval shall not be greater than 8 dBm in any 3 kHz bandwidth within these bands.

(e) The processing gain of a direct sequence system shall be at least 10 dB. 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.

(f) Hybrid systems that employ a combination of both direct sequence and frequency hopping modulation techniques shall achieve a processing gain of at least 17 dB from the combined techniques. The frequency hopping operation of the hybrid system, with the direct sequence operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period equal to the number of hopping frequencies employed multiplied by 0.4. The direct sequence operation of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

NOTE: Spread spectrum systems are sharing these bands on a non-interference basis with systems supporting critical Government requirements that have been allocated the usage of these bands, secondary only to ISM equipment operated under the provisions of part 18 of this chapter. Many of these Government systems are airborne radiolocation systems that emit a high EIRP, which can cause interference to other users. Also, investigations of the effect of spread spectrum interference to U.S. Government operations in the 902-928 MHz band may require a future decrease in the power limits allowed for spread spectrum operation.

3.2.2 § 15.207 Conducted Limits

(a) For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with the provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

(b) The following option may be employed if the conducted emissions exceed the limits in paragraph (a) of this section when measured using instrumentation employing a quasi-peak detector function: If the level of the emission measured using the quasi-peak instrumentation is 6 dB, or more, higher than the level of the same emission measured with instrumentation having an average detector and a 9 kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13 dB for comparison to the limits. When employing this option, the following conditions shall be observed:

(1) The measuring instrumentation with the average detector shall employ a linear IF amplifier.

(2) Care must be taken not to exceed the dynamic range of the measuring instrument when measuring an emission with a low duty cycle.

(3) The test report required for verification of for an application for a grant of equipment authorization shall contain all details supporting the use of this option.

(c) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operation as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μV within the frequency band 535-1705 kHz.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §§ 15.205, 15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(d) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operation while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

3.2.3 Test Procedure

The testing was performed according to the procedures in ANSI C63.4 (1992). Testing was performed at CCL's anechoic chamber located in Salt Lake City, Utah. This site has been fully described in a report submitted to the FCC, and was accepted in a letter dated March 6, 1996 (31040/SIT).

CCL participates in the National Voluntary Laboratory Accreditation Program (NVLAP) and has been accepted under NVLAP Lab Code:100272-0, which is effective until September 30,1999.

For radiated emissions testing that is performed at distances closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

SECTION 4. OPERATION OF EUT DURING TESTING.

4.1 Operating Environment:

Power Supply: 120VAC
AC Mains Frequency: 60Hz

4.2 Operating Modes:

Each mode of operation was exercised to produce worst case emissions. The worst case emissions were with the MDW9031 running in the following mode. The MDW9031 was placed in the transmit mode with the same type of modulation that would normally be used during normal operation.

The AC line conducted test was performed with the base station power supply plugged into the LISN and with the handset placed in the battery charger, with the battery charger plugged into the LISN.

4.3 Configuration & Peripherals:

The MDW9031 was placed on the table in the transmit mode with the same type of modulation that would normally be used during normal operation.

SECTION 5. SUMMARY OF TEST RESULTS:

5.1 FCC PART 15.247, Subpart C

5.1.1 Summary of Tests:

Section	Test Performed	Frequency Range (MHz)	Result
15.247 (a)(1)	Hopping Channel Carrier Frequencies	902 to 928	Complied
15.247 (a)(1)(i)	Emission Bandwidth	902 to 928	Complied
15.247 (b)(2)	Peak Output Power	902 to 928	Complied
15.247 (C)	Antenna Conducted Spurious Emissions	30 to 10,000	Complied
15.247 (C)	Radiated Spurious Emissions	30 to 10,000	Complied
15.207	Line Conducted Emissions (Hot Lead to Ground)	0.45 to 30	Complied
15.207	Line Conducted Emissions (Neutral Lead to Ground)	0.45 to 30	Complied

5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.

SECTION 6. MEASUREMENTS, EXAMINATIONS AND DERIVED RESULTS:

6.1 General Comments:

This section contains the test results only. Details of the test methods used, etc., can be found in Appendix B of this report.

6.2 Test Results

6.2.1 § 15.247 (a) (1)

Demonstration of Compliance:

See theory of operation in Exhibit 12.

6.3.2 § 15.247 (a) (1) (i)

Demonstration of Compliance:

See theory of operation in Exhibit 12.

Measurement Data Emission Bandwidth:

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

Base Station

Frequency (MHz)	Measured Emission Bandwidth (kHz)
902.1	143.1
915.0	143.4
927.9	143.7

Handset

Frequency (MHz)	Measured Emission Bandwidth (kHz)
902.1	134.7
915.0	138.6
927.9	135.0

RESULT

In the configuration tested, the EUT complied with the requirements of the specification (see spectrum analyzer plots in Appendix C).

6.2.3 § 15.247 (b) Peak Output Power:

Measurement Data:

The maximum peak output power measured for this device was 129.0 mW or 21.1 dBm. Shown below is the measured peak output power. The maximum directional gain of the antenna is less than 6 dBi; therefore, the maximum output power is not required to be reduced from the value measured.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

Base Station

Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (mW)
902.1	21.0	126.0
915.0	18.4	69.2
927.9	20.8	120.0

Handset

Frequency (MHz)	Measured Output Power (dBm)	Measured Output Power (mW)
902.1	20.8	120.0
915.0	19.2	83.2
927.9	21.1	129.0

RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

6.2.4 § 15.247 (c) Spurious Emissions:

Measurement Data Antenna Conducted Emissions:

The frequency range from 30 MHz to the tenth harmonic of the highest fundamental frequency was investigated to measure any antenna-conducted emissions. Shown in Appendix C are plots with the MDW9031 tuned to the upper and lower band edges. These demonstrate compliance with the provisions of this section.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3 and 4.

Base Station

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 21.0 – 20.0 = 1.0 dBm.

Transmitting at 902.1 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	97.3	-55.2 *	1.0
200 - 901.9	373.6	-46.0 *	1.0
928.1 - 2000	1804.1	-27.4	1.0

Transmitting at 902.1 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
2000 - 3000	2706.3	-33.2	1.0
3000 - 4000	3608.5	-39.9	1.0
4000 - 5000	4510.5	-44.2 *	1.0
5000 - 6000	5412.6	-43.9 *	1.0
6000 - 7000	6314.7	-38.2 *	1.0
7000 - 8000	7216.8	-38.7 *	1.0
8000 - 9000	8118.9	-38.2 *	1.0
9000 - 10000	9021.0	-38.0 *	1.0
* Noise Floor			

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 18.4 – 20.0 = -1.6 dBm.

Transmitting at 915.0 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	89.5	-42.6 *	-1.6
200 - 901.9	579.5	-45.7 *	-1.6
928.1 - 2000	1830.0	-31.7	-1.6
2000 - 3000	2745.0	-39.1	-1.6
3000 - 4000	3660.0	-37.8	-1.6
4000 - 5000	4575.0	-44.0 *	-1.6
5000 - 6000	5490.0	-44.3 *	-1.6
6000 - 7000	6405.0	-37.9 *	-1.6
7000 - 8000	7320.0	-38.5 *	-1.6
8000 - 9000	8235.0	-38.5 *	-1.6
9000 - 10000	9150.0	-38.5 *	-1.6
* Noise Floor			

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 20.8 – 20.0 = 0.8 dBm.

Transmitting at 927.9 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	67.3	-32.8	0.8
200 - 901.9	716.1	-43.1	0.8
928.1 - 2000	1855.8	-29.3	0.8
2000 - 3000	2783.7	-39.2	0.8
3000 - 4000	3711.6	-37.2	0.8
4000 - 5000	4639.5	-42.5 *	0.8
5000 - 6000	5567.4	-43.6 *	0.8
6000 - 7000	6495.3	-38.4 *	0.8
7000 - 8000	7423.2	-38.4 *	0.8
8000 - 9000	8351.1	-37.2 *	0.8
9000 - 10000	9279.0	-37.2 *	0.8
* Noise Floor			

Handset

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 20.8 – 20.0 = 0.8 dBm.

Transmitting at 902.1 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	38.5	-45.5 *	0.8
200 - 901.9	800.0	-46.0 *	0.8
928.1 - 2000	1804.1	-42.7	0.8
2000 - 3000	2706.3	-39.4	0.8
3000 - 4000	3608.5	-44.1 *	0.8
4000 - 5000	4510.5	-44.1 *	0.8
5000 - 6000	5412.6	-43.7 *	0.8
6000 - 7000	6314.7	-38.0 *	0.8
7000 - 8000	7216.8	-37.9 *	0.8
8000 - 9000	8118.9	-38.3 *	0.8
9000 - 10000	9021.0	-37.2 *	0.8
* Noise Floor			

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 19.2 – 20.0 = -0.8 dBm.

Transmitting at 915.0 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	158.5	-43.9 *	-0.8
200 - 901.9	634.7	-45.2 *	-0.8
928.1 - 2000	1830.0	-43.6	-0.8
2000 - 3000	2745.0	-38.2	-0.8
3000 - 4000	3660.0	-44.5 *	-0.8
4000 - 5000	4575.0	-45.1 *	-0.8
5000 - 6000	5490.0	-44.5 *	-0.8
6000 - 7000	6405.0	-37.7 *	-0.8
7000 - 8000	7320.0	-38.4 *	-0.8
8000 - 9000	8235.0	-37.8 *	-0.8
9000 - 10000	9150.0	-38.6 *	-0.8
* Noise Floor			

The emissions must be attenuated 20 dB below the highest power level measured; therefore, the criteria is 21.1 – 20.0 = 1.1 dBm.

Transmitting at 927.9 MHz			
Frequency Range MHz	Frequency MHz	Corrected Level dBm	Criteria dBm
30 -200	181.0	-45.0 *	1.1
200 - 901.9	673.4	-45.5 *	1.1
928.1 - 2000	1855.8	-41.8	1.1
2000 - 3000	2783.7	-31.8	1.1
3000 - 4000	3711.6	-43.4 *	1.1
4000 - 5000	4639.5	-43.4 *	1.1
5000 - 6000	5567.4	-45.1 *	1.1
6000 - 7000	6495.3	-38.5 *	1.1
7000 - 8000	7423.2	-39.0 *	1.1
8000 - 9000	8351.1	-38.1 *	1.1
9000 - 10000	9279.0	-37.4 *	1.1
* Noise Floor			

Measurement Data Radiated Emissions Restricted Bands § 15.205:

The frequency range from 30 MHz to 10 GHz was investigated to measure any radiated emissions in the restricted bands.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3, 4, 6, 7, 8, 9 and 12.

AVERAGE FACTOR

The MDW9031 transmits for 2.4 msec on one specific hop channel, then is off for 240 msec. Therefore, the total pulse period in 100 msec is 2.4 msec.

The average factor for the MDW9031 is –32.4 dB. This factor is derived using the following formula:

$$20 \log \frac{2.4 \text{ msec}}{100 \text{ msec}} = 20 \log 0.024 = -32.4 \text{ dB}$$

The maximum allowed average factor is –20.0 dB; therefore, this figure was used to determine compliance.

See Appendix C for the pulse trains that were used to compute this average factor.

Base Station

The base station uses two antennas for diversity purposes; therefore, measurements were performed with the base station transmitting on both antennas. The results for both measurements are shown below.

Vertical Polarity

Transmitting at 902.1 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
975.0 *	-1.0	35.5	0.0	34.5	54.0
3900.0 *	-2.6	40.2	0.0	37.6	54.0
2706.3 **	20.8	36.3	-20.0	37.1	54.0
3608.4 **	11.3	39.4	-20.0	30.7	54.0
4510.8 **	15.5	42.0	-20.0	37.5	54.0
5412.6 **	9.0	46.3	-20.0	35.3	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 902.1 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
975.0 *	8.5	35.5	0.0	44.0	54.0
2706.3 **	15.9	36.3	-20.0	32.2	54.0
3608.4 **	15.6	39.4	-20.0	35.0	54.0
4510.5 **	14.4	42.0	-20.0	36.4	54.0
5412.6 **	11.1	46.3	-20.0	37.4	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
987.9 *	2.5	35.8	0.0	38.3	54.0
2745.0 **	22.4	36.3	-20.0	38.7	54.0
3660.0 **	11.2	39.5	-20.0	30.7	54.0
4575.0 **	12.0	42.2	-20.0	34.2	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
974.7 *	4.3	35.8	0.0	40.1	54.0
2745.0 **	14.1	36.3	-20.0	30.4	54.0
3660.0 **	11.2	39.5	-20.0	30.7	54.0
4575.0 **	11.7	42.2	-20.0	33.9	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 927.9 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	24.3	36.5	-20.0	40.8	54.0
3711.6 **	19.2	39.6	-20.0	38.8	54.0
4639.5 **	11.7	42.3	-20.0	34.0	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 927.9 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	12.1	36.5	-20.0	28.6	54.0
3711.6 **	13.5	39.6	-20.0	33.1	54.0
4639.5 **	11.0	42.3	-20.0	33.3	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Horizontal Polarity

Transmitting at 902.1 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
975.0 *	-1.8	35.5	0.0	33.7	54.0
2706.3 **	27.1	36.3	-20.0	43.4	54.0
3608.4 **	11.1	39.4	-20.0	30.5	54.0
4510.5 **	15.1	42.0	-20.0	37.1	54.0
5412.6 **	10.9	46.3	-20.0	37.2	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 902.1 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
975.0 *	-1.0	35.5	0.0	34.5	54.0
2706.3 **	17.2	36.3	-20.0	33.5	54.0
3608.4 **	12.0	39.4	-20.0	31.4	54.0
4510.5 **	13.8	42.0	-20.0	35.8	54.0
5412.6 **	11.2	46.3	-20.0	37.5	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
987.9 *	-3.5	35.8	0.0	32.3	54.0
2745.0 **	22.4	36.3	-20.0	38.7	54.0
3660.0 **	11.5	39.5	-20.0	31.0	54.0
4575.0 **	12.0	42.2	-20.0	34.2	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
987.9 *	-1.2	35.8	0.0	34.6	54.0
2745.0 **	21.8	36.3	-20.0	38.6	54.0
3660.0 **	11.3	39.5	-20.0	30.8	54.0
4575.0 **	12.1	42.2	-20.0	34.3	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 927.9 MHz (Antenna A)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	28.6	36.5	-20.0	45.1	54.0
3711.6 **	18.4	39.6	-20.0	38.0	54.0
4639.5 **	9.9	42.3	-20.0	32.2	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 927.9 MHz (Antenna B)					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	21.0	36.5	-20.0	37.5	54.0
3711.6 **	15.3	39.6	-20.0	35.9	54.0
4639.5 **	11.8	42.3	-20.0	34.1	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Handset

Vertical Polarity

Transmitting at 902.1 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2706.3 **	25.6	36.3	-20.0	41.9	54.0
3608.4 **	17.2	39.4	-20.0	36.6	54.0
4510.5 **	18.2	42.0	-20.0	40.2	54.0
5412.6 **	17.7	46.3	-20.0	44.0	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2745.0 **	22.4	36.3	-20.0	38.7	54.0
3660.0 **	16.7	39.5	-20.0	36.2	54.0
4575.0 **	17.5	42.2	-20.0	39.7	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 927.9 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	28.2	36.5	-20.0	44.4	54.0
3711.6 **	23.0	39.6	-20.0	42.6	54.0
4639.5 **	10.2	42.3	-20.0	32.5	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Horizontal Polarity

Transmitting at 902.1 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2706.3 **	26.4	36.3	-20.0	42.7	54.0
3608.4 **	16.5	39.4	-20.0	35.9	54.0
4510.5 **	17.6	42.0	-20.0	39.6	54.0
5412.6 **	17.9	46.3	-20.0	44.2	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Transmitting at 915.0 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2745.0 **	24.6	36.3	-20.0	40.9	54.0
3660.0 **	16.2	39.5	-20.0	35.7	54.0
4575.0 **	17.1	42.2	-20.0	39.3	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

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Transmitting at 927.9 MHz					
Frequency MHz	Receiver Reading dBμV	Correction Factor dB	Average Factor dB	Corrected Reading dBμV/m	Limit dBμV/m
2783.7 **	25.0	36.5	-20.0	41.5	54.0
3711.6 **	19.5	39.6	-20.0	39.1	54.0
4639.5 **	10.8	42.3	-20.0	33.1	54.0

* Emissions from Transmit Local Oscillator (LO) – Measurements were performed with a RBW of 10 kHz and a VBW of 30 kHz in order to increase the sensitivity of the measurement. Measurements performed with a RBW of 1 MHz and VBW of 3 MHz were determined to be the noise floor of the spectrum analyzer.

** Transmitter harmonic emissions. Testing was performed with RBW of 1 MHz and VBW of 3 MHz. Since the harmonic emissions are pulsed emissions the readings were reduced by an average factor of –20.0 dB (see calculation included with this section).

Sample Field Strength Calculation:

The field strength is calculated by adding the Correction Factor (Antenna Factor + Cable Factor), to the measured level from the receiver. The basic equation with a sample calculation is shown below:

FS = RA + CF - AF Where
FS = Field Strength
RA = Receiver Amplitude (Receiver Reading - Amplifier Gain)
CF = Correction Factor (Antenna Factor + Cable Factor)
AF = Average Factor

RESULT

In the configuration tested, the EUT complied with the requirements of the specification.

6.2.5 § 15.207 Conducted Limits

The frequency range from 450 kHz to 30 MHz was investigated to measure any AC line conducted emissions.

A diagram of the test configuration is enclosed in Appendix A and a list of reference codes for test equipment used is enclosed in Appendix B.

Test equipment used: 1, 3, 4 and 13.

Line Conducted Data - (Hot Lead) Base Station

Frequency MHz	Detector	Measured Level dBμV	Limit dBμV
0.45	Peak	29.9	48.0
0.65	Peak	28.4	48.0
0.86	Peak	27.9	48.0
1.38	Peak	25.0	48.0
9.59	Peak	20.4	48.0

Line Conducted Data - (Neutral Lead) Base Station

Frequency MHz	Detector	Measured Level dBμV	Limit dBμV
0.86	Peak	29.1	48.0
1.38	Peak	25.4	48.0
7.94	Peak	20.7	48.0
11.8	Peak	20.0	48.0
15.5	Peak	22.4	48.0
17.36	Peak	20.2	48.0

Line Conducted Data - (Hot Lead) Handset

Frequency MHz	Detector	Measured Level dBμV	Limit dBμV
0.48	Peak	32.6	48.0
0.77	Peak	41.6	48.0
1.06	Peak	32.0	48.0
10.02	Peak	33.9	48.0
12.06	Peak	28.2	48.0
20.28	Peak	36.0	48.0
28.41	Peak	24.5	48.0

Line Conducted Data - (Neutral Lead) Handset

Frequency MHz	Detector	Measured Level dBμV	Limit dBμV
0.60	Peak	32.8	48.0
0.74	Peak	40.9	48.0
1.03	Peak	36.8	48.0
9.89	Peak	33.1	48.0
10.18	Peak	33.3	48.0
20.28	Peak	34.3	48.0

APPENDIX A. TEST EQUIPMENT USED:

Reference No.	Type	Manufacturer	Model
1	Anechoic Chamber	EMC Test Systems	N/A
2	Wanship Open Area Test Site	CCL	N/A
3	Spectrum Analyzer	Hewlett Packard	8568B or 8566B
4	Quasi-Peak Detector	Hewlett Packard	8565A
5	Biconical Antenna	EMCO	3108 or 3104P
6	Log-Periodic Antenna	EMCO	3146
7	Biconilog Antenna	EMCO	3142
8	Double Ridged Guide Antenna	EMCO	3115
9	Pre-Amplifier	Hewlett Packard	8447D
10	Power Amplifier	Hewlett Packard	8447E
11	Power Amplifier	Hewlett Packard	8449A
12	Power Amplifier	Hewlett Packard	8449B
13	LISN Anechoic Chamber	EMCO	3825/2
14	LISN Wanship	EMCO	3725

An independent calibration laboratory following outlined calibration procedures calibrates all the equipment listed above every 12 months.

APPENDIX B. TEST PROCEDURES:

Line Conducted Emissions:

The line-conducted emission from the digital apparatus was measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 450 kHz to 30 MHz frequency range.

The line conducted emissions measurements are performed in a screen room using a (50 Ω/50 μH) Line Impedance Stabilization Network (LISN).

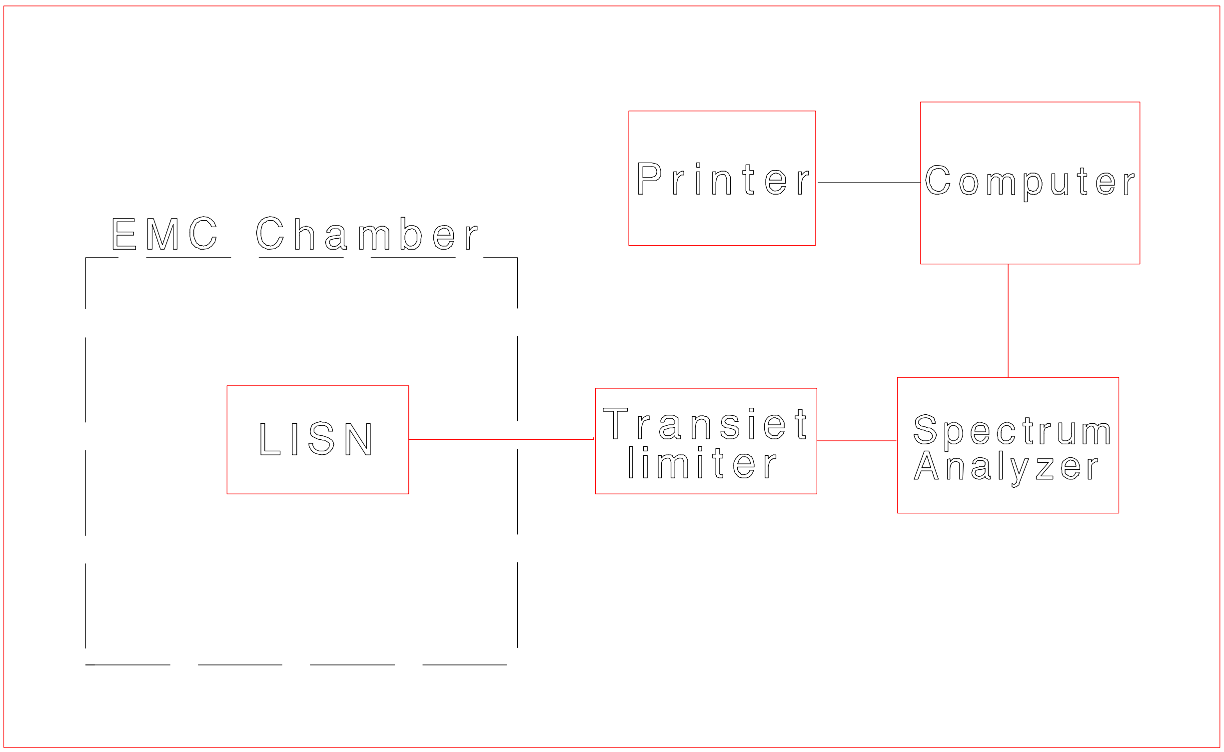
Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of digital apparatus with each digital apparatus having its own power cord, the point of connection for the LISN is determined from the following rules:

a) Each power cord, which is terminated in a mains supply plug, shall be tested separately.
b) Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
c) Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.

Desktop digital apparatus are placed on a non-conducting table at least 80 cm from the metallic floor. The equipment is placed a minimum of 40 cm from all walls. Floor standing equipment is placed directly on the earth grounded floor.

Line Conducted Emissions Test



Radiated Spurious Emissions:

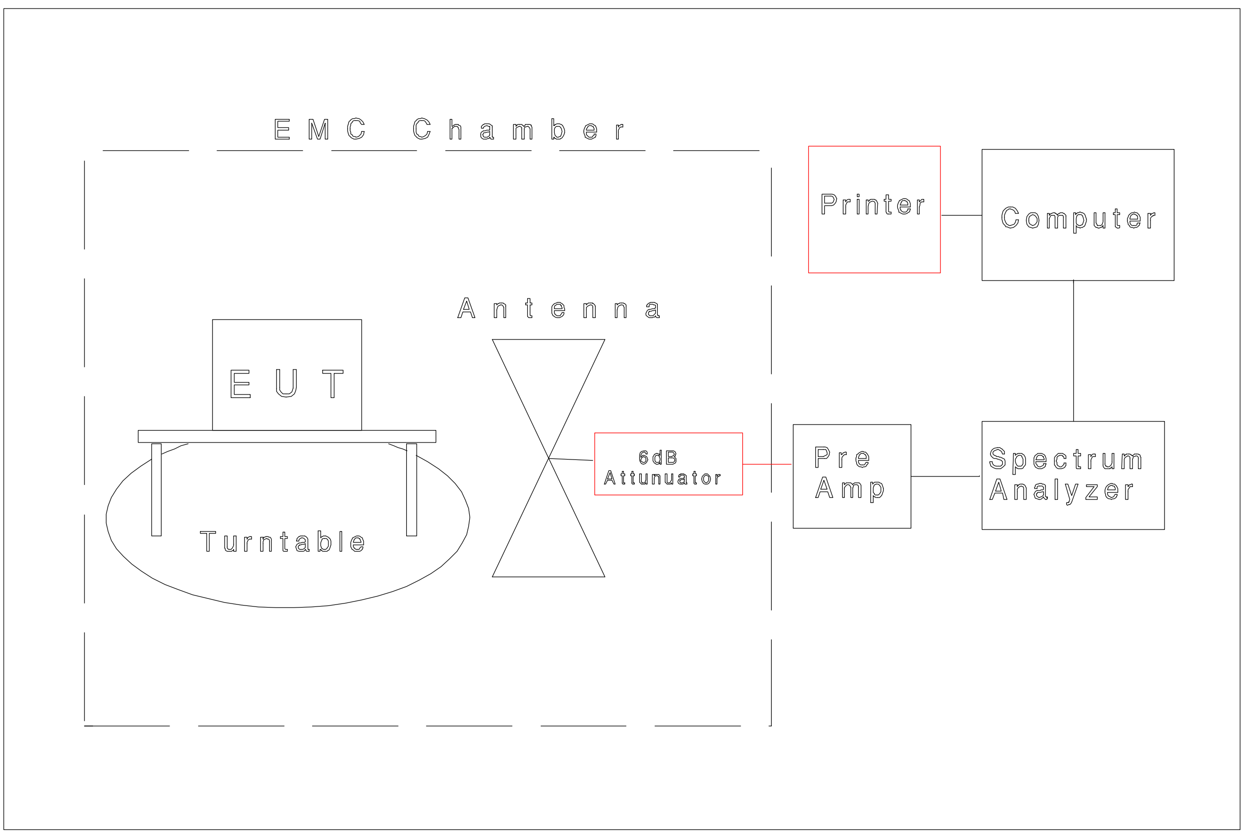
The radiated emission from the transmitter was measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings. A preamplifier with a fixed gain of 30 dB was used to increase the sensitivity of the measuring instrumentation.

A Biconilog antenna was used to measure the frequency range of 30 to 1000 MHz and a Double Ridge Guide Horn antenna was used to measure the frequency range 1 GHz to 10 GHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors.

The configuration of the transmitter was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.4 via the interconnecting cables listed in Section 2.5. These interconnecting cable were manipulated manually by a technician to obtain worst case radiated emissions. The digital apparatus was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Transmitters are measured on a non-conducting table one-meter above the ground plane. The table is placed on a turntable which is level with the ground plane. The turntable has slip rings, which supply AC power to the digital apparatus. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

Radiated Emissions Test



FCC Sections 15.247 Peak Transmit Power, Emission Bandwidth and Spurious Emissions (antenna conducted)

The EUT was directly connected to the spectrum analyzer via the antenna output port as shown in the block diagram below.

The measurements were performed on three channels, as per 47 CFR 15.31(m), one near the bottom of the spectrum, one near the middle of the spectrum and one near the top of the spectrum.

The spectrum analyzer's resolution bandwidth and video bandwidth were set as follows:

Peak Transmit Power

RBW = 100 kHz
VBW = 300 kHz

Emission Bandwidth

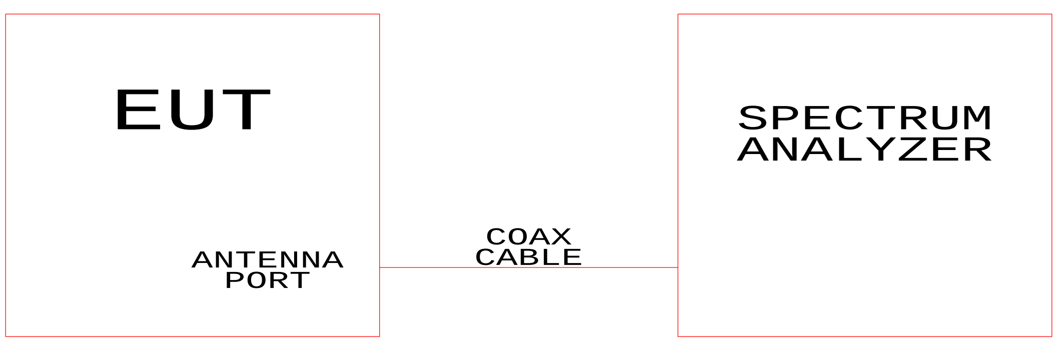
RBW = 3 kHz
VBW = 10 kHz

Spurious Emissions (Antenna Conducted)

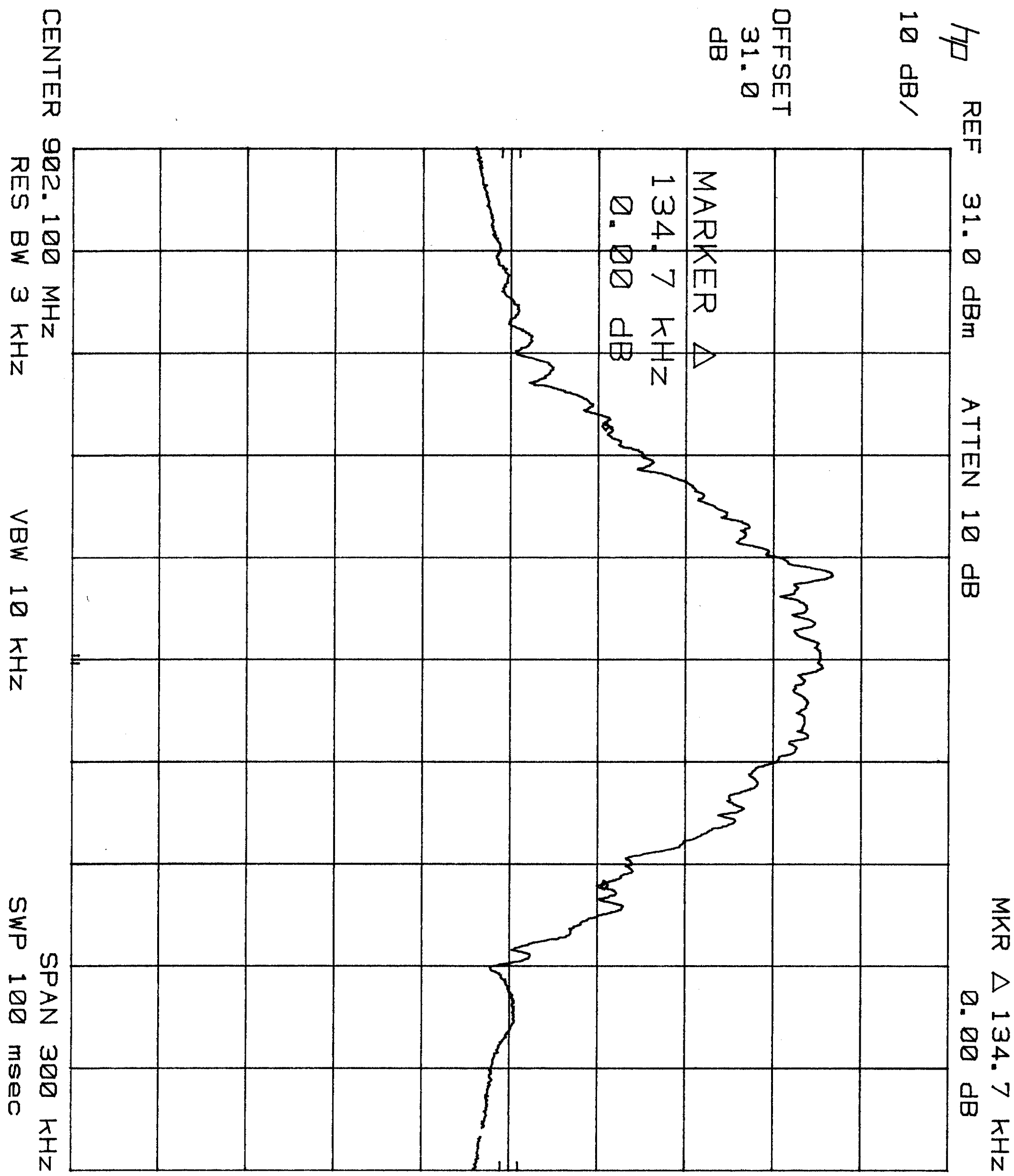
RBW = 100 kHz – 30 MHz to 1000 MHz
VBW = 300 kHz

RBW = 1 MHz – 1 GHz to 10 GHz
VBW = 3 MHz

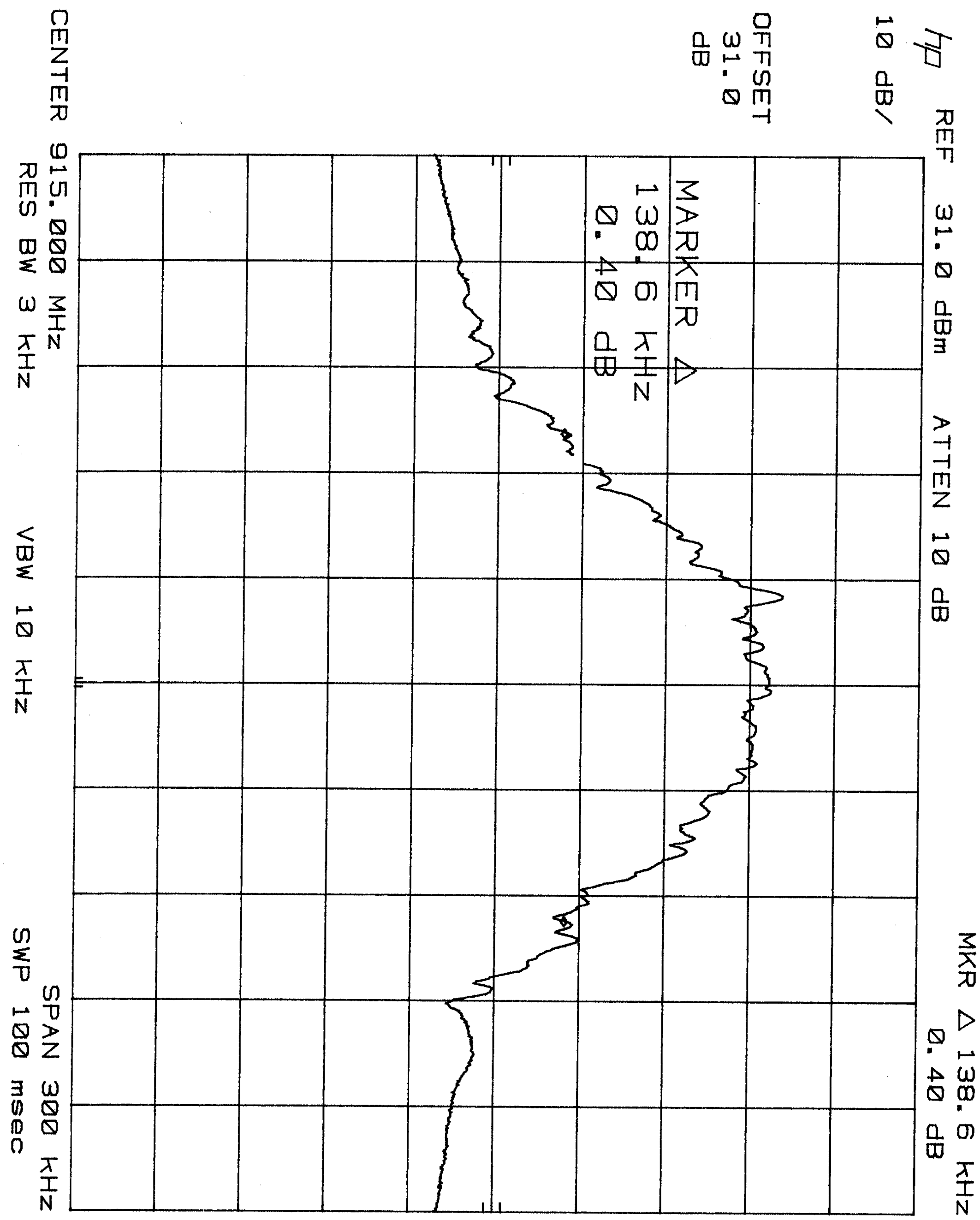
Test Configuration Block Diagram



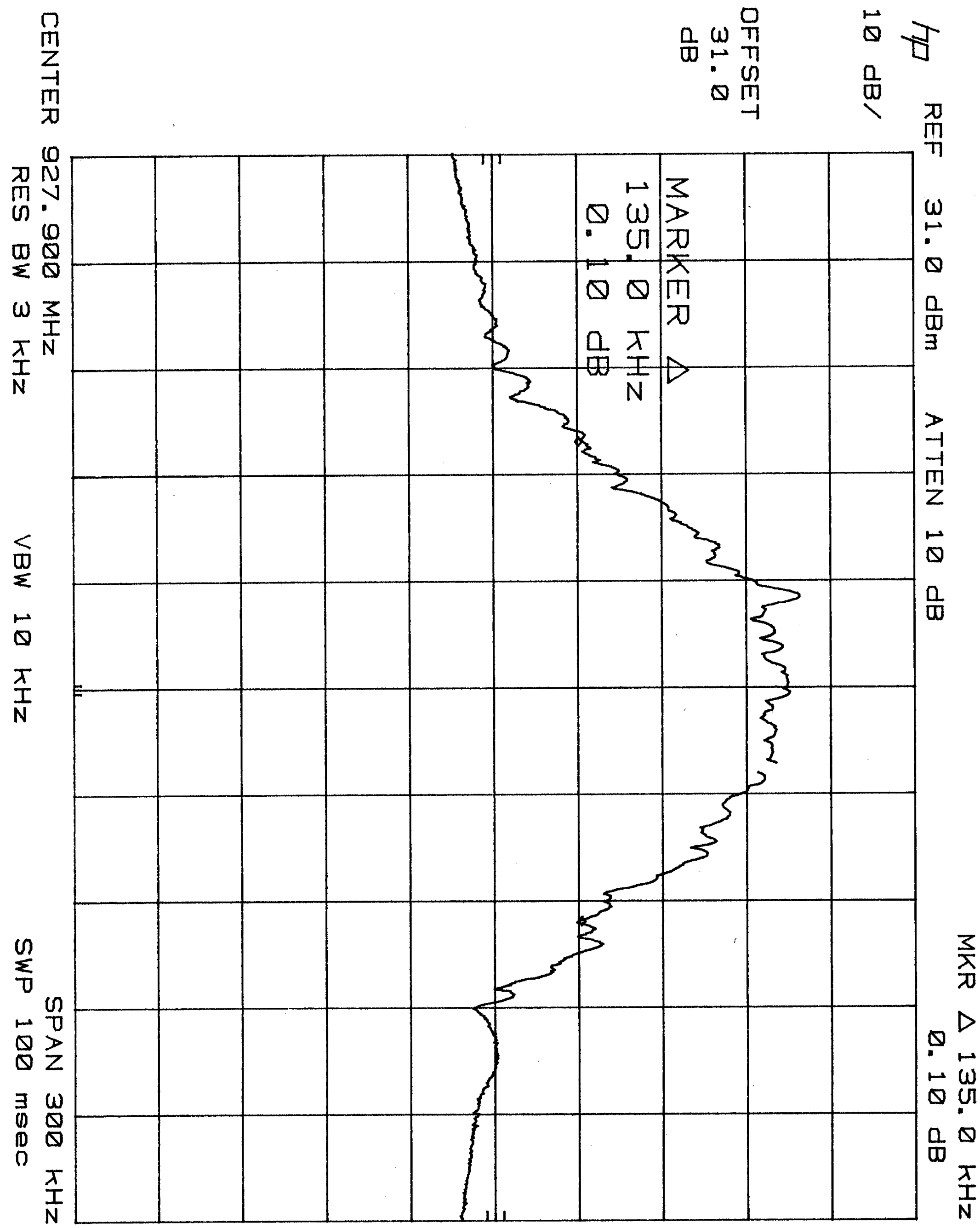
APPENDIX C. SPECTRUM ANALYZER PLOTS:



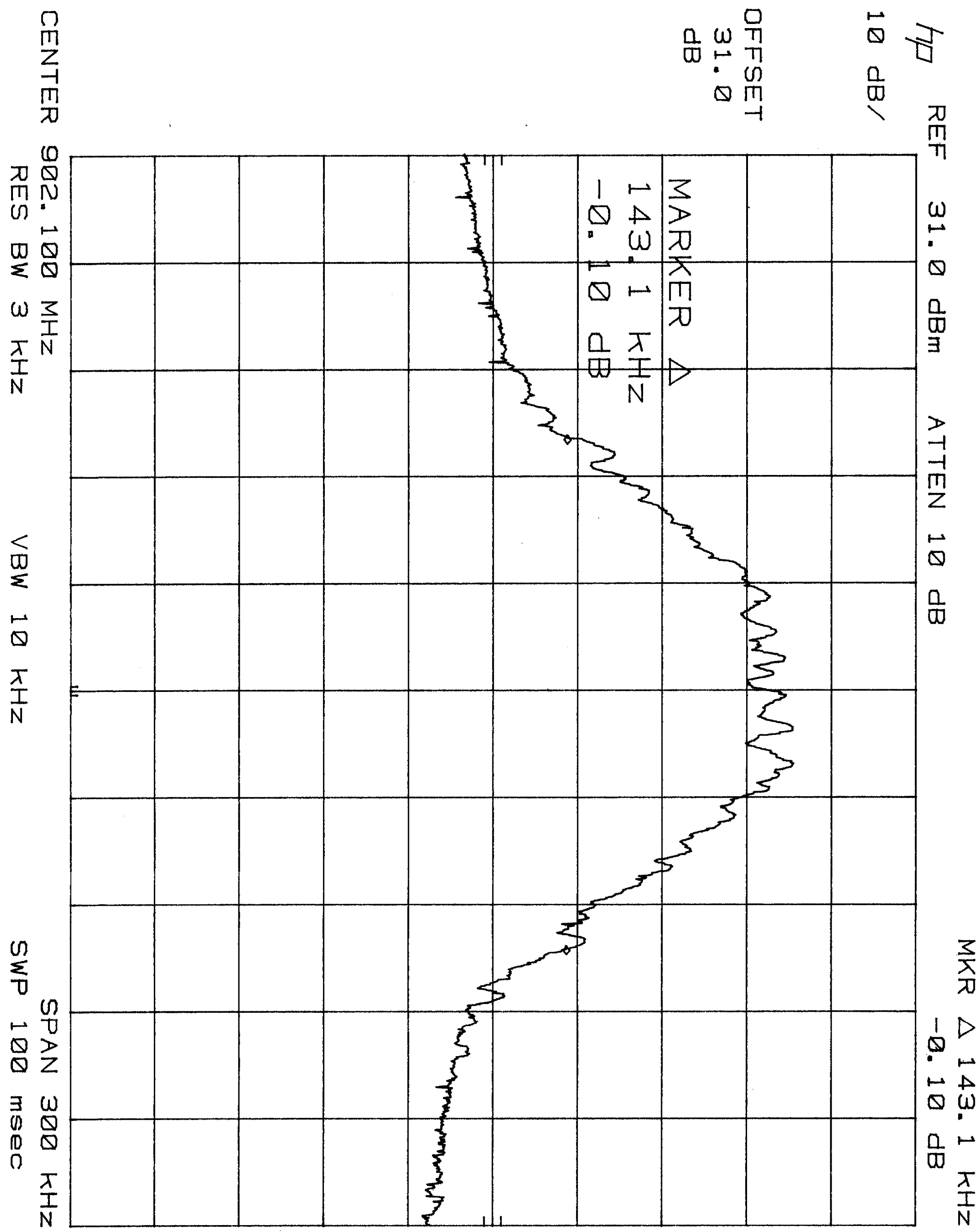
Emission Bandwidth Plot (Handset)



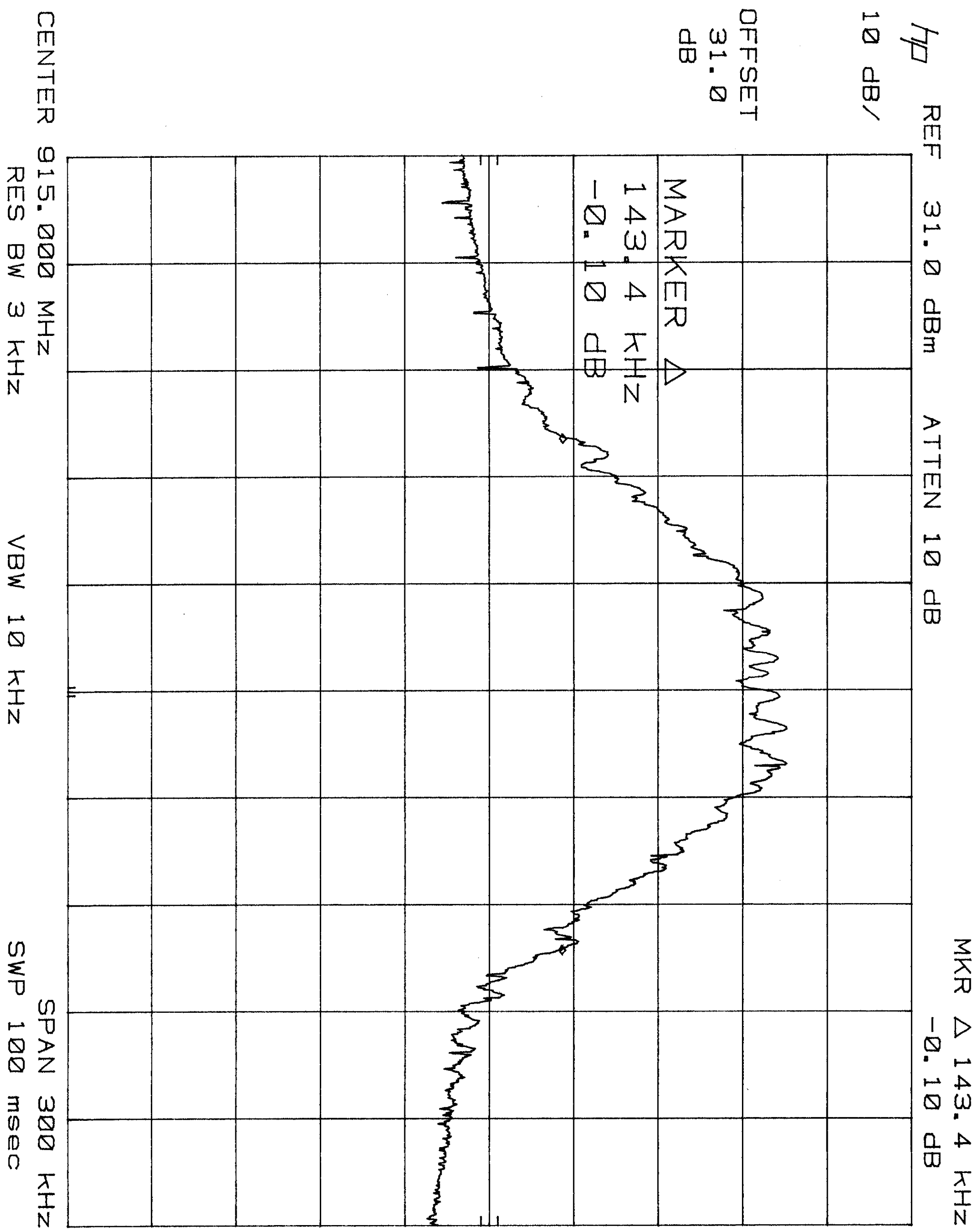
Emission Bandwidth Plot (Handset)



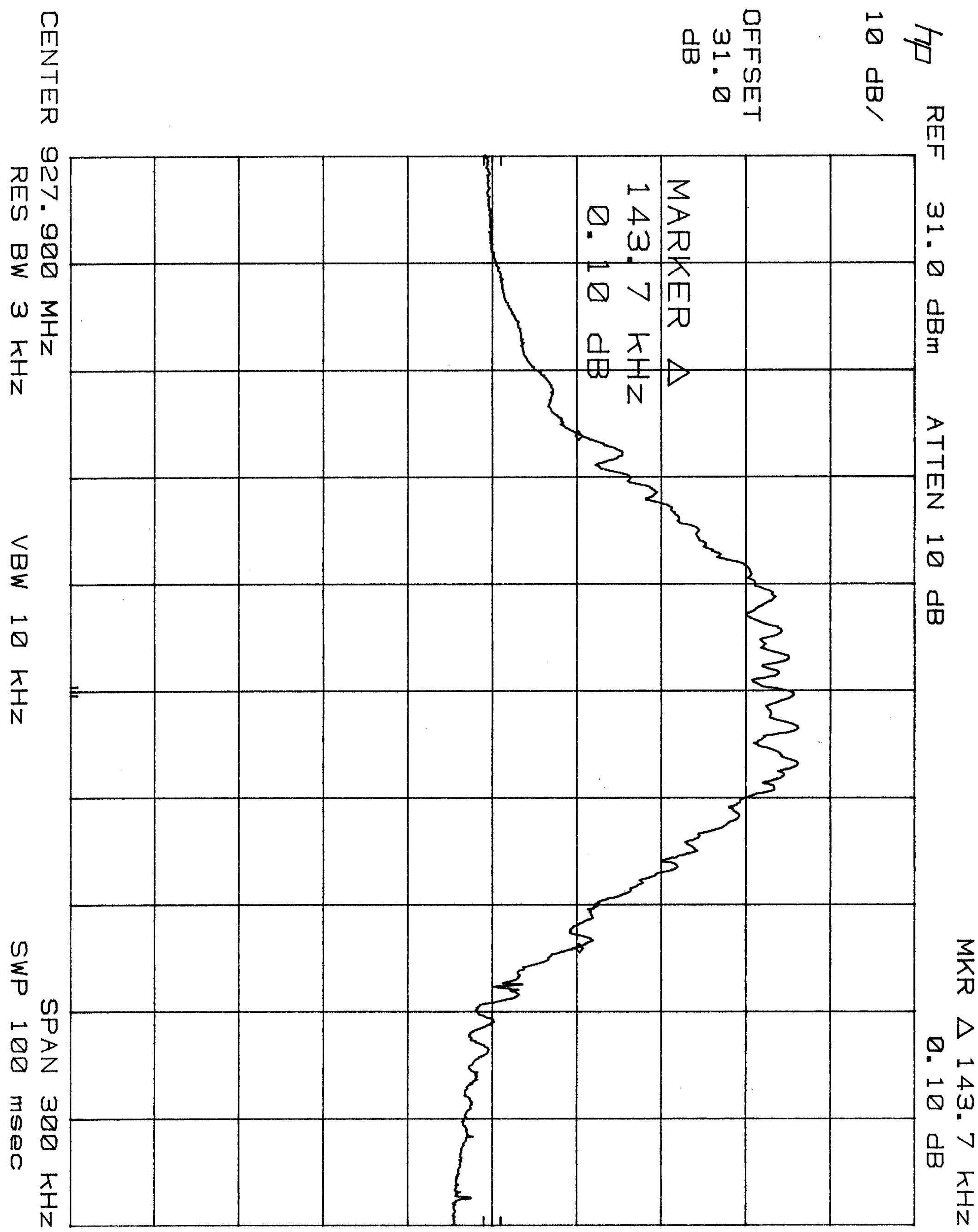
Emission Bandwidth Plot (Handset)



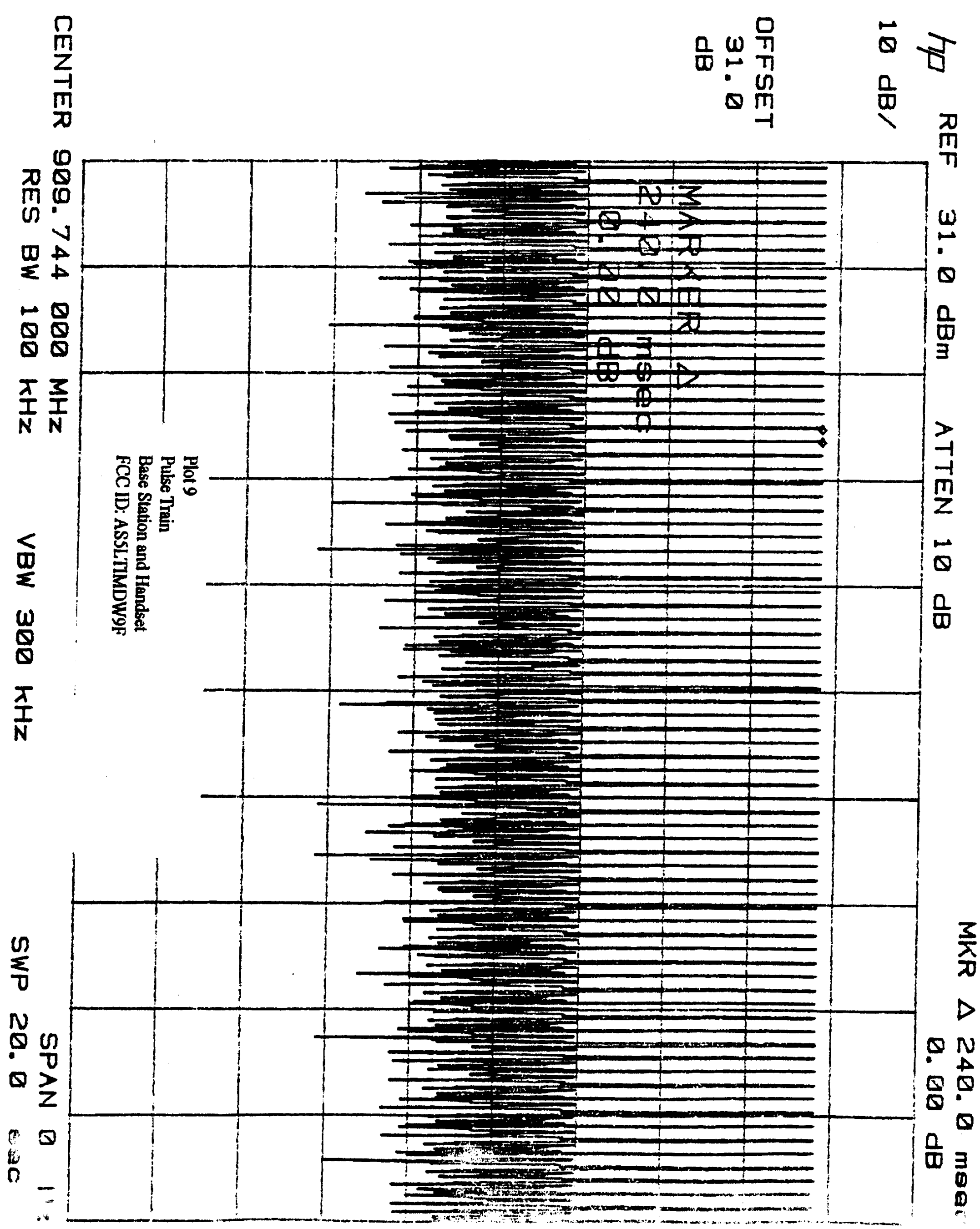
Emission Bandwidth Plot (Base Station)



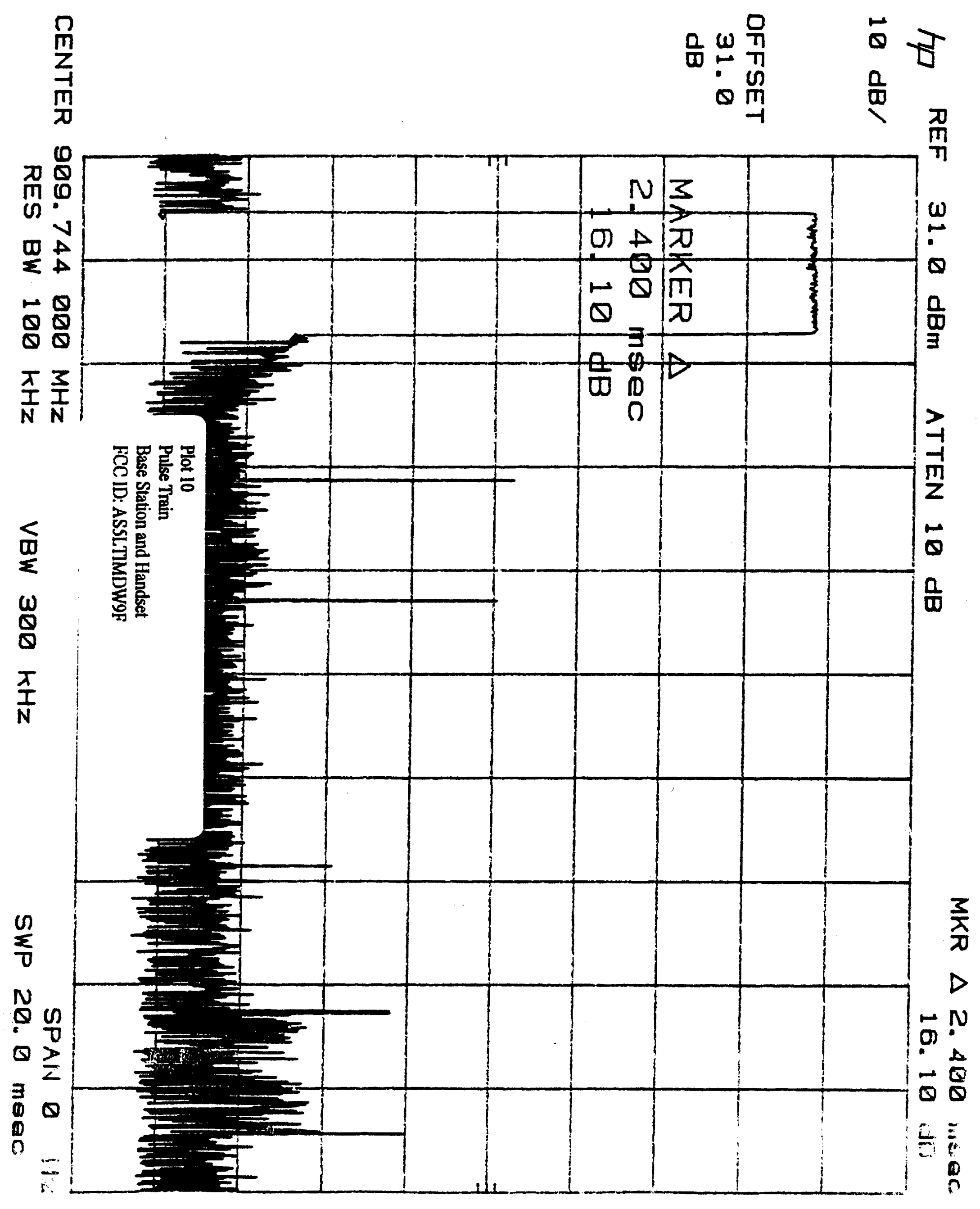
Emission Bandwidth Plot (Base Station)



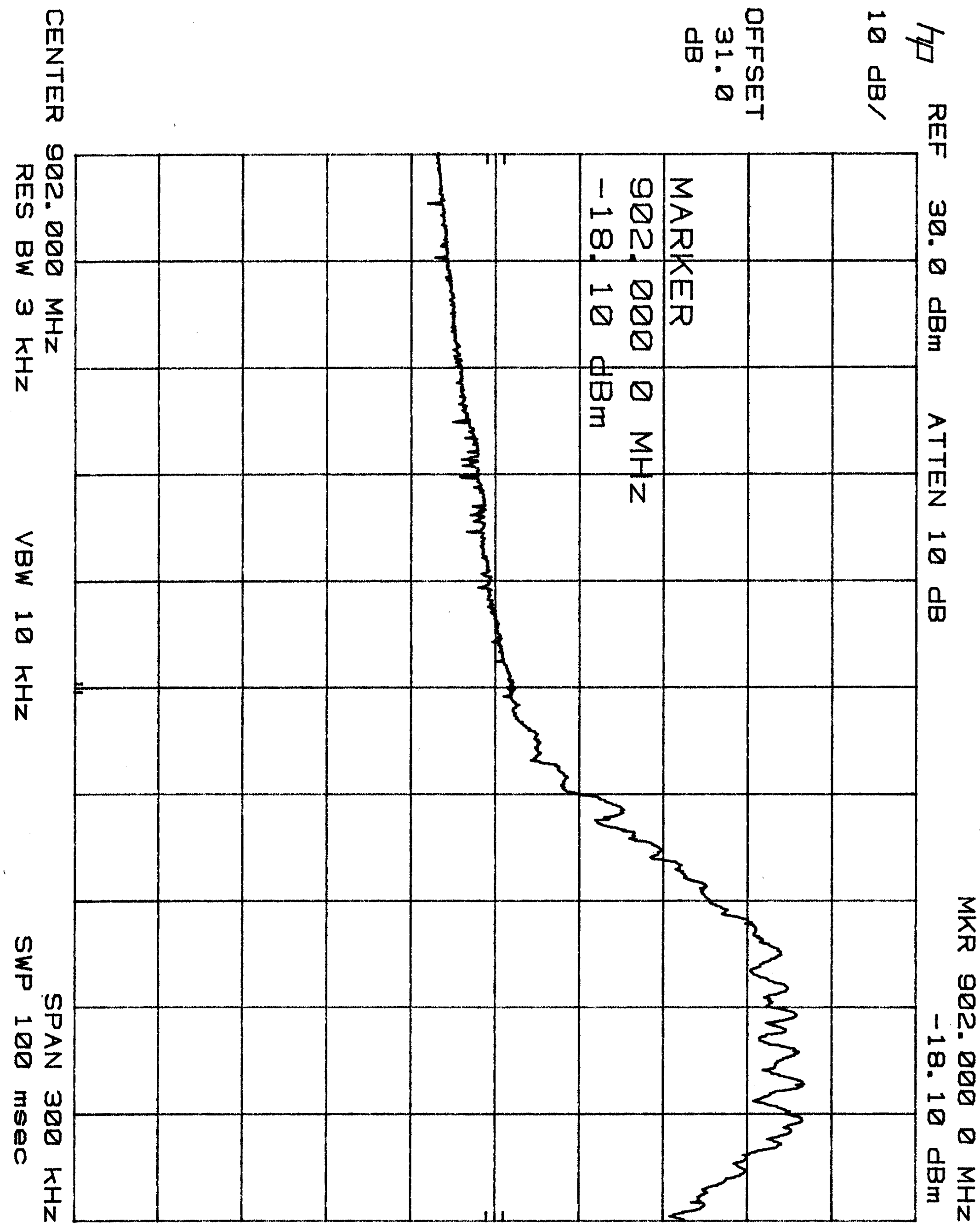
Emission Bandwidth Plot (Base Station)



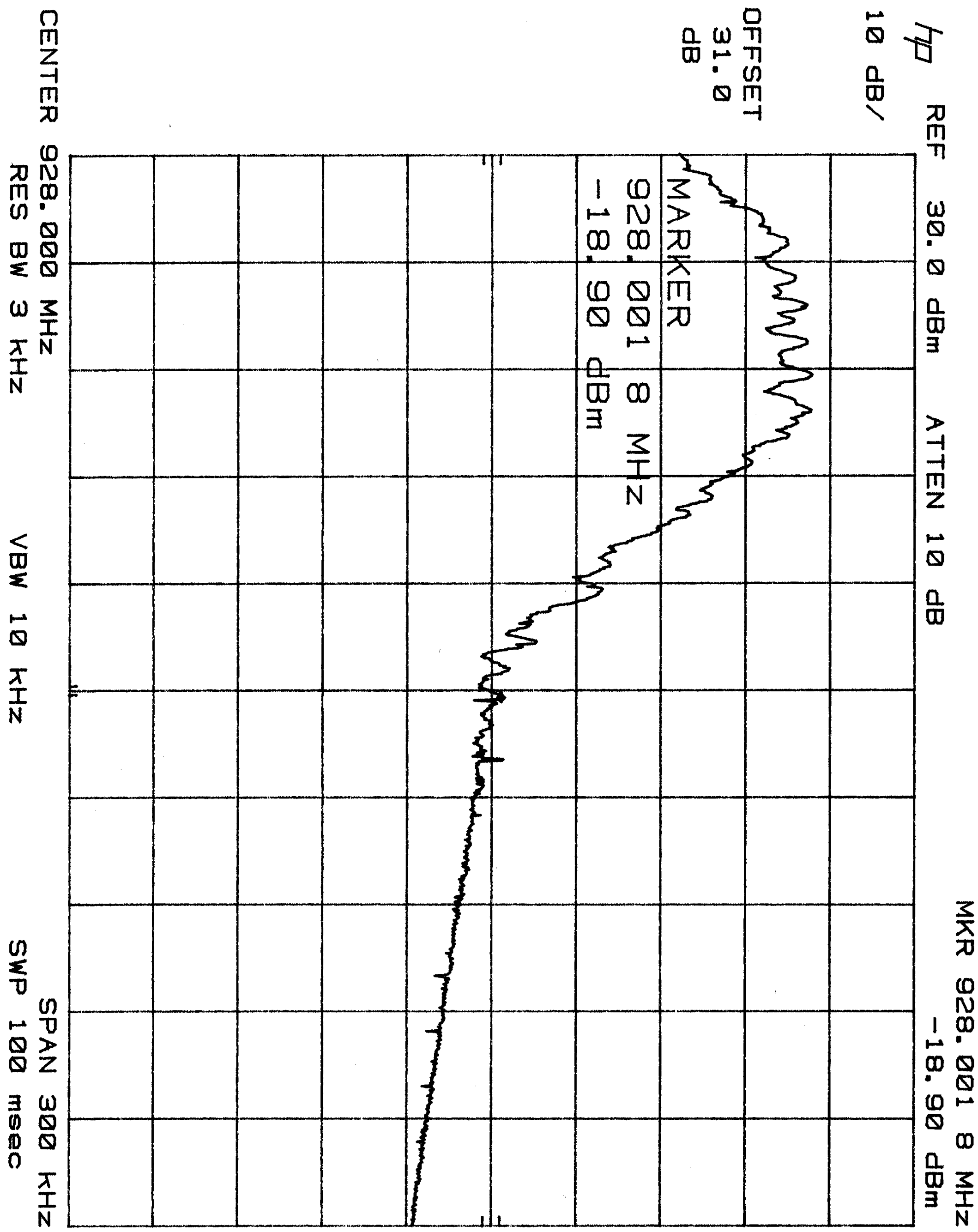
Pulse Train Plot



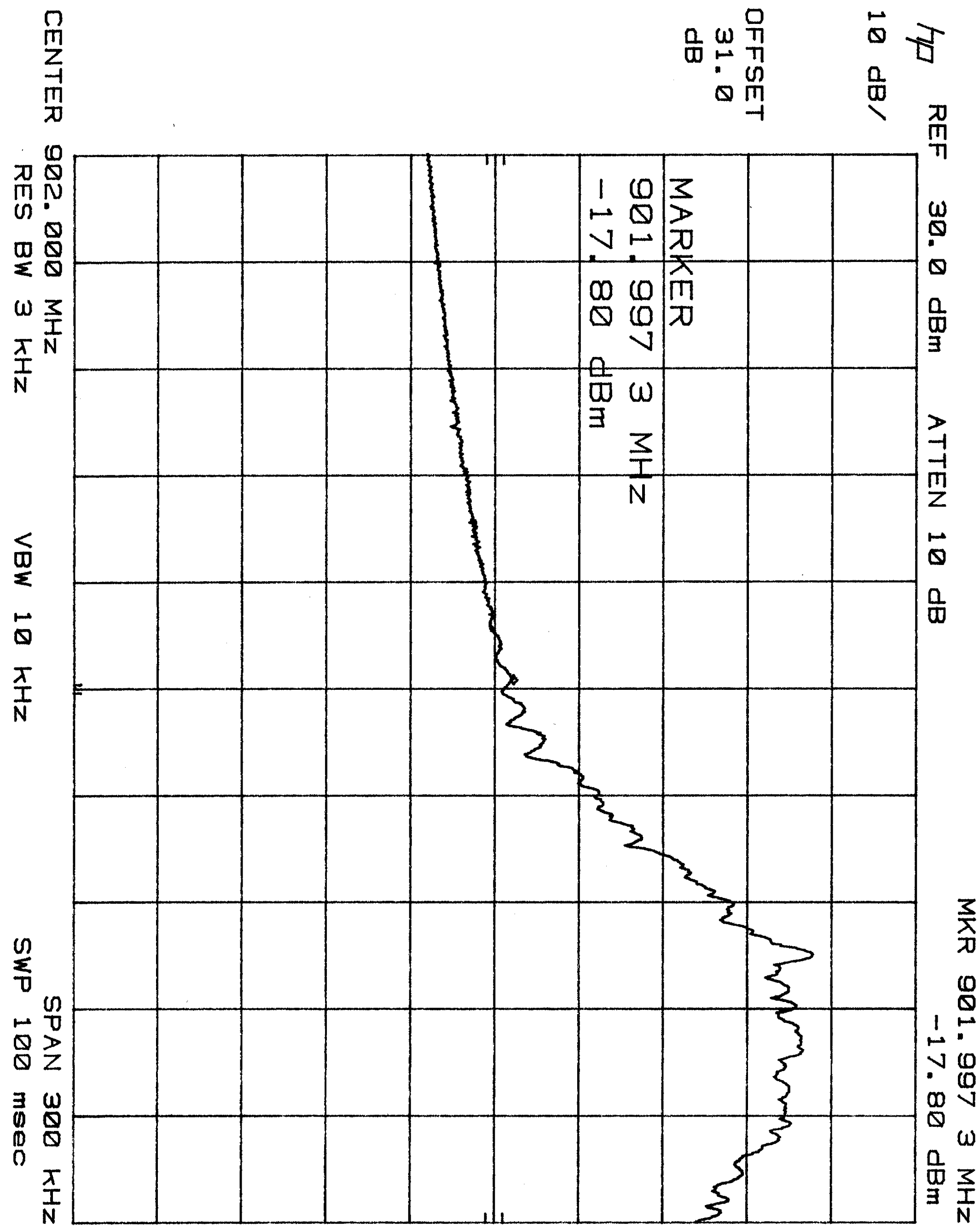
Pulse Train Plot



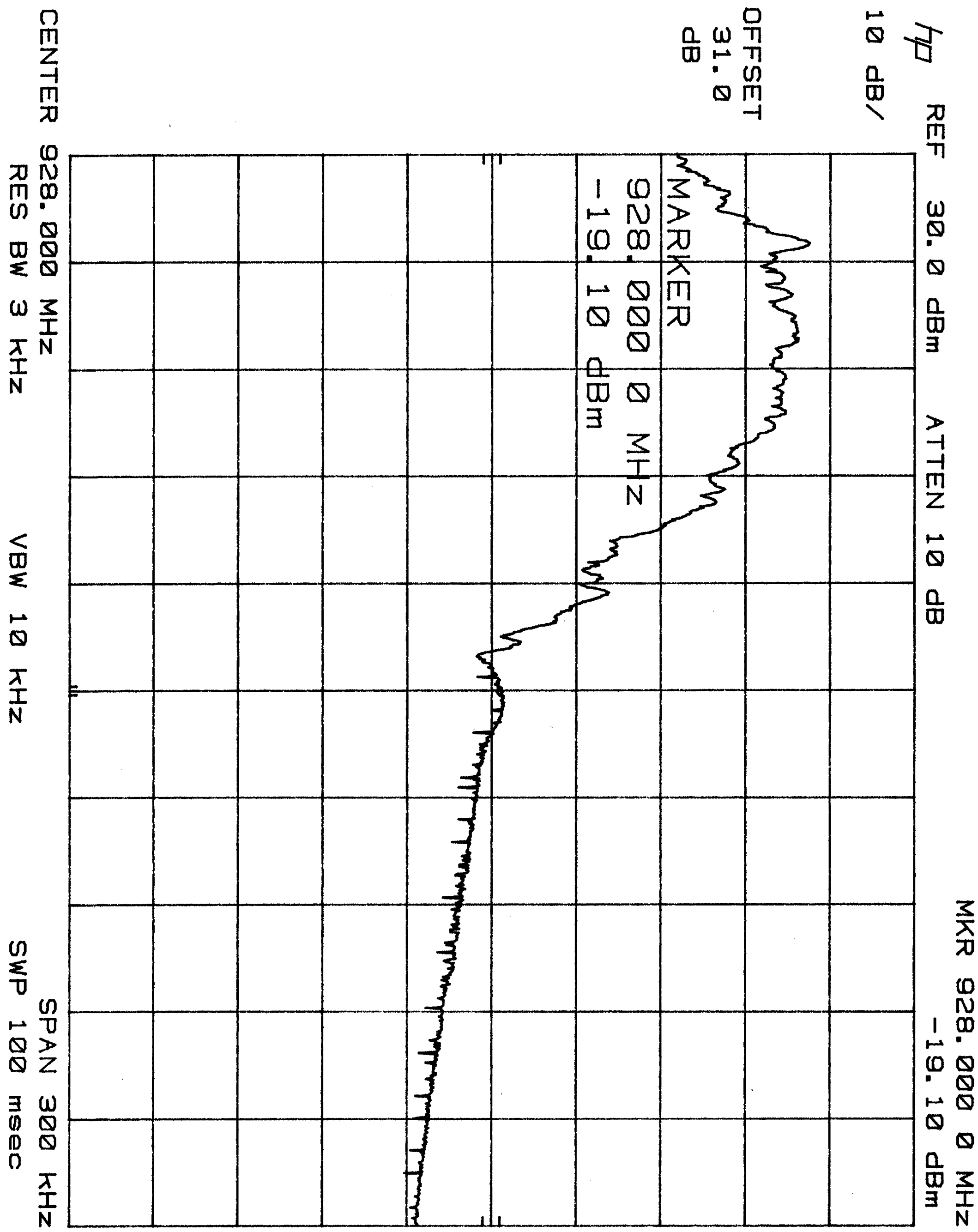
Spurious Emissions Plot – Lower Band (Handset)



Spurious Emissions Plot – Upper Band (Handset)



Spurious Emissions Plot – Lower Band (Base Station)



Spurious Emissions Plot – Upper Band (Base Station)