

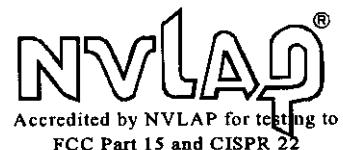
# ITS Intertek Testing Services

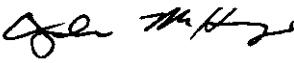
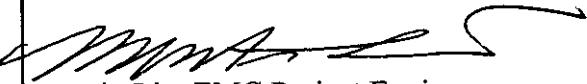
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**Application for FCC Certification  
for  
Telko, Inc.  
on the  
Door Chime Transmitter  
FCC ID: FGFW004  
Model: W001  
Model: W002  
Model: W004**

Test Report: J99015274-004  
Date of Report: July 23, 1999

Total pages this report: 78



Signature of Tester:	 John McHenry, Senior EMC Associate Engineer
Signature of Reviewer:	 Martin Liu, EMC Project Engineer

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# Intertek Testing Services

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## 1.0 Summary of Tests

**Telko, Inc.**  
**FCC ID: FGFW004**  
**Model: W001**  
**Model: W002**  
**Model: W004**

TEST	REFERENCE	RESULTS
Radiated Emission	15.231(b)	Complies
Out of Band Radiated Emission	15.231(b)	Complies
Conducted Emission	15.207	Complies
20 dB Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Not Applicable
Antenna Requirement	15.203	Complies

**2.0 General Description****2.1 Product Description**

The Telko, Inc. Model W001 is a remote wireless door chime transmitter. Model W002 is a magnetic activation door chime transmitter. Model W004 is an infrared activation door chime transmitter. For more information, please see product information in Section 11.0 of this report.

**Overview of the EUT**

Company	Telko, Inc.
Trade Name and Model No.	Telko, Inc., Model W001, Model W002, Model W004
FCC Identifier	FGFW004
Use of Product	Door chime transmitter
Transmitter Activation	<input checked="" type="checkbox"/> Manual and automatically deactivate within 5 seconds of being released <input type="checkbox"/> Periodic transmissions
Frequency Range (MHZ)	317
Antenna Requirement	The EUT uses a permanently connected antenna
Manufacturer Name and Address	Sparko (Far East) Ltd. Dayuancun, Chiling Houjie Dongguan, Guandong, China

**2.2 Related Submittal(s) Grants**

This is an Application for Certification of low power transmitter. Three transmitters are included in this Application. This specific report details the emission characteristics of the transmitters.

### 2.3 Test Methodology

Both line-conducted (if applicable) and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **“Data Section”** of this Application. All other measurements were made in accordance with the procedures in Part 2 of CFR 47.

### 2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located in Laguna Niguel, California. This test facility and site measurement data have been fully placed on file with the FCC.

### **3.0 System Test Configuration**

#### **3.1 Support Equipment**

The device is a standing alone device, powered with 12 VDC external power source.

#### **3.2 Block Diagram of Test Setup**

Please refer to the set-up photo on Section 4.2 of the report.

#### **3.3 Justification**

For emission testing, the equipment under test (EUT) was configured for testing in a mode of transmitting signal continuously. During testing, all cables were manipulated to produce worst case emissions.

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

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance if measured at a closer distance.

#### **3.4 EUT Exercising Software**

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

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

**3.5 Mode of Operation During Test**

During the tests, the dip switches were set to achieve the highest duty cycle.

**3.6 Modification Required for Compliance**

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

No modifications were installed by Intertek Testing Services.

#### **4.0 Measurement Results**

Line conducted emission measurements were performed from 0.45 MHZ to 30 MHZ. Analyzer resolution is 9 kHz or greater.

For radiated emission measurements were performed from 30 MHZ to 3.5 GHz. Analyzer setting was as follows unless otherwise stated:

	RES BW	VID BW
Frequency < 1 GHz	120 kHz	300 kHz (Peak measurement)
Frequency > 1 GHz	1 MHZ	3 MHZ (Peak measurement)

The radiated field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG + DF$$

where      FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$   
              RA = Receiver Amplitude (including pre-amplifier) in  $\text{dB}\mu\text{V}$   
              AF = Antenna Factor in dB  
              CF = Cable Attenuation Factor in dB  
              AG = Amplifier Gain in dB  
              DF = Distance Factor

In the following table(s), the reading shown on the data table reflects the pre-amplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where      FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$   
              RR = RA - AG in  $\text{dB}\mu\text{V}$   
              LF = CF + AF + DF in dB

Assume a receiver reading of 52.0  $\text{dB}\mu\text{V}$  is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32  $\text{dB}\mu\text{V}/\text{m}$ . This value in  $\text{dB}\mu\text{V}/\text{m}$  was converted to its corresponding level in  $\mu\text{V}/\text{m}$ .

$$\begin{array}{ll} RA = 52.0 \text{ dB}\mu\text{V} & DF = 0 \text{ dB} \\ AF = 7.4 \text{ dB} & RR = 23.0 \text{ dB}\mu\text{V} \\ CF = 1.6 \text{ dB} & LF = 9.0 \text{ dB} \\ AG = 29.0 \text{ dB} & \\ FS = RR + LF & \\ FS = 23 + 9 = 32 \text{ dB}\mu\text{V}/\text{m} & \end{array}$$

$$\text{Level in } \mu\text{V}/\text{m} = \text{Common Antilogarithm} [(32 \text{ dB}\mu\text{V}/\text{m})/20] = 39.8 \mu\text{V}/\text{m}$$

# Intertek Testing Services

## 4.1 Radiated Emission Test Results

Company: Telko, Inc.  
Model: W001  
Test Engineer: Martin Liu  
Data of Test: 6/14/1999

### FCC 15.231 Radiated Emissions ( 3 meters measurement distance)

Frequency MHZ	Antenna Polarization	PK Field Strength dBuV/m	Duty Cycle dB	Corrected AV dBuV/m	Limit dBuV/m	Margin dBuV/m
317.0	H	82.9	-9.6	73.3	75.7	-2.4
317.0	V	70.8	-9.6	61.2	75.7	-14.5
633.8	H	44.7	-9.6	35.1	55.7	-20.6
633.8	V	43.1	-9.6	33.5	55.7	-22.2
952.3	V	49.7	-9.6	40.1	55.7	-15.6
952.3	H	47.1	-9.6	37.5	55.7	-18.2
1267.0	V	54.2	-9.6	44.6	55.7	-11.1
1267.0	H	51.0	-9.6	41.4	55.7	-14.3
1584.3	H	46.9	-9.6	37.3	54.0 *	-16.7
1584.3	V	42.3	-9.6	32.7	54.0 *	-21.3

#### Note:

1. Limit for restricted bands in FCC 15.205 is indicated with asterisk \*\*.
2. The table shows the worst case radiated emissions.
3. All antenna factors and cable factors are included in final peak measurement.
4. Duty Cycle =  $20 \times \log \{[(10 \times 0.60) + (3 \times 0.30)]/20.925\} = -9.6$  (dB).
5. Negative sign (-) in the margin column signifies level below the limit.

# Intertek Testing Services

Company: Telko, Inc.  
Model: W002  
Test Engineer: John McHenry  
Data of Test: 6/22/1999

## FCC 15.231 Radiated Emissions ( 3 meters measurement distance)

Frequency MHZ	Antenna Polarization	PK Field Strength dBuV/m	Duty Cycle dB	Corrected AV dBuV/m	Limit dBuV/m	Margin dBuV/m
316.9	H	67.3	-9.5	57.8	75.7	-17.9
316.9	V	67.2	-9.5	57.7	75.7	-18.0
633.9	V	44.5	-9.5	35.0	55.7	-20.7
633.9	H	39.3	-9.5	29.8	55.7	-25.9
950.7	V	35.9	-9.5	26.4	55.7	-29.3
950.7	H	32.0	-9.5	22.5	55.7	-33.2
1267.0	V	38.7	-9.5	29.2	55.7	-26.5
1267.0	H	35.9	-9.5	26.4	55.7	-29.3
1584.0	V	39.5	-9.5	30.0	54.0 *	-24.0
1584.0	H	38.9	-9.5	29.4	54.0 *	-24.6

### Note:

1. Limit for restricted bands in FCC 15.205 is indicated with asterisk "\*".
2. The table shows the worst case radiated emissions.
3. All antenna factors and cable factors are included in final peak measurement.
4. Duty Cycle =  $20 \times \log \{[(10 \times 0.60) + (3 \times 0.30)]/20.625\} = -9.5$  (dB).
5. Negative sign (-) in the margin column signifies level below the limit.

# Intertek Testing Services

Company: Telko, Inc.  
Model: W004  
Test Engineer: John McHenry  
Data of Test: 6/22/1999

## FCC 15.231 Radiated Emissions ( 3 meters measurement distance)

Frequency MHZ	Antenna Polarization	PK Field Strength dBuV/m	Duty Cycle dB	Corrected AV dBuV/m	Limit dBuV/m	Margin dBuV/m
316.8	V	70.6	-9.4	61.2	75.7	-14.5
316.8	H	64.2	-9.4	54.8	75.7	-20.9
633.5	V	47.3	-9.4	37.9	55.7	-17.8
633.5	H	50.5	-9.4	41.1	55.7	-14.6
950.5	V	35.2	-9.4	25.8	55.7	-29.9
950.5	H	32.3	-9.4	22.9	55.7	-32.8
1277.0	V	37.5	-9.4	28.1	55.7	-27.6
1277.0	H	35.7	-9.4	26.3	55.7	-29.4
1583.0	V	39.5	-9.4	30.1	54.0 *	-23.9
1583.0	H	38.3	-9.4	28.9	54.0 *	-25.1

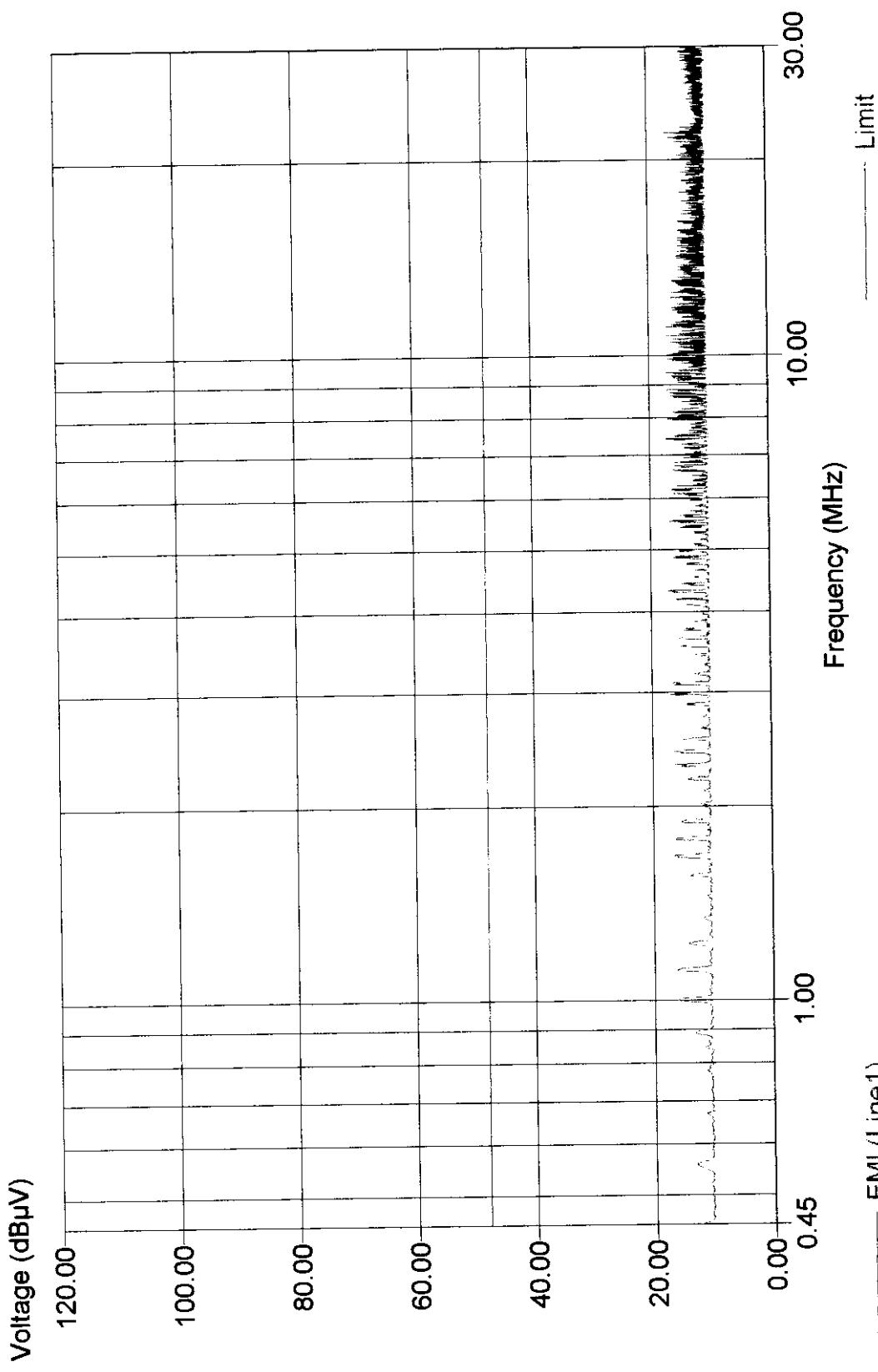
### Note:

1. Limit for restricted bands in FCC 15.205 is indicated with asterisk "\*".
2. The table shows the worst case radiated emissions.
3. All antenna factors and cable factors are included in final peak measurement.
4. Duty Cycle =  $20 \times \log \{[(10 \times 0.60) + (3 \times 0.30)]/20.250\} = -9.4$  (dB).
5. Negative sign (-) in the margin column signifies level below the limit.

Title: Conducted Emissions  
File: WO01L.SET  
EUT Type: Telko M/N: W001, Transmitter (+12VDC) Conductor  
Operator: JM

06/23/99  
Sequence: Preliminary Scan

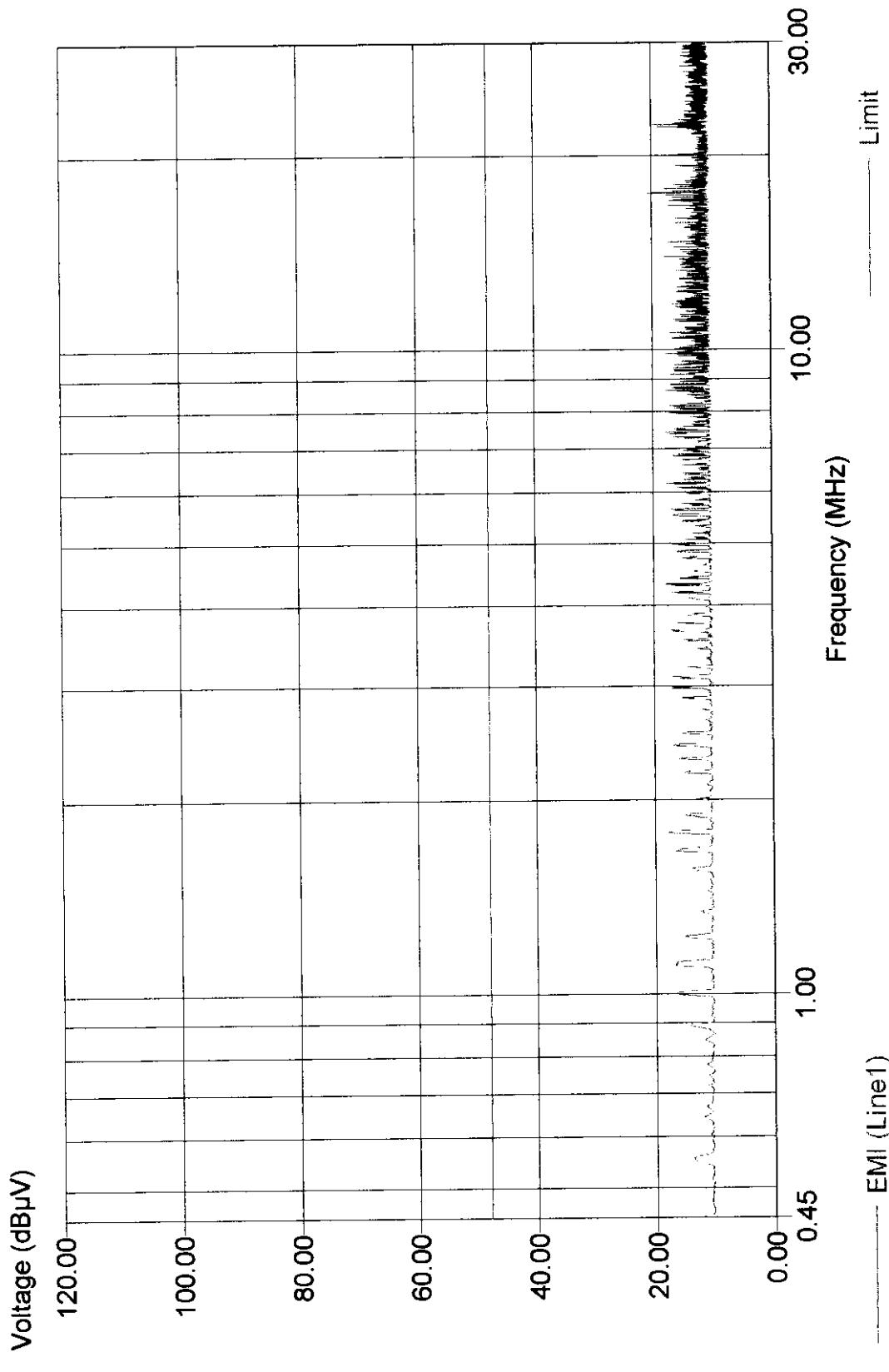
FIGURE 4



Title: Conducted Emissions  
File: W001N.SET  
EUT Type: Telko M/N: W001, Transmitter (-12VDC) Conductor  
Operator: JM

06/23/99  
Sequence: Preliminary Scan

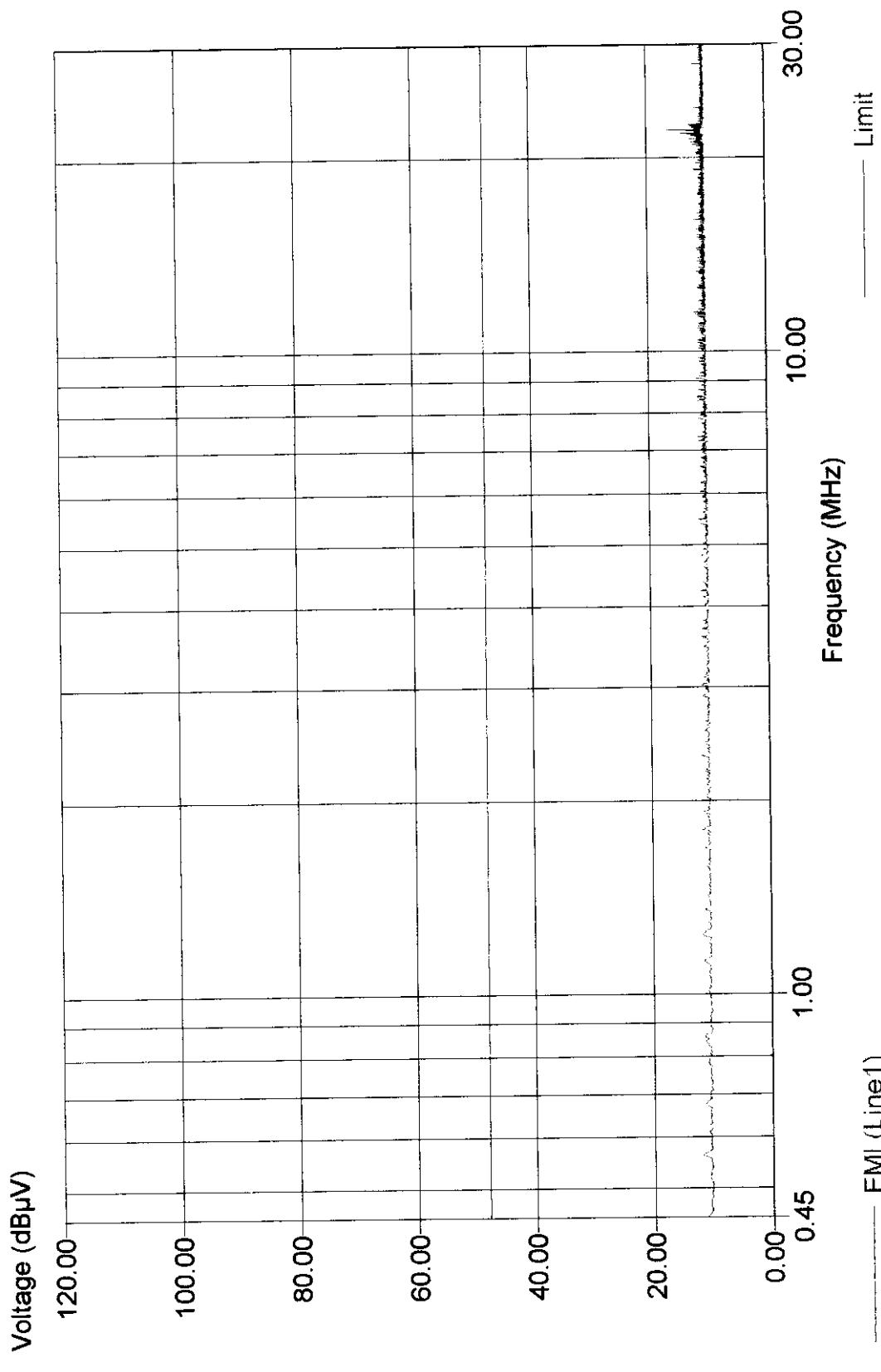
FIGURE 5



Title: Conducted Emissions  
File: W002L.SET  
EUT Type: Telko M/N: W002, Transmitter (+12VDC) Conductor  
Operator: JM

06/22/99  
Sequence: Preliminary Scan

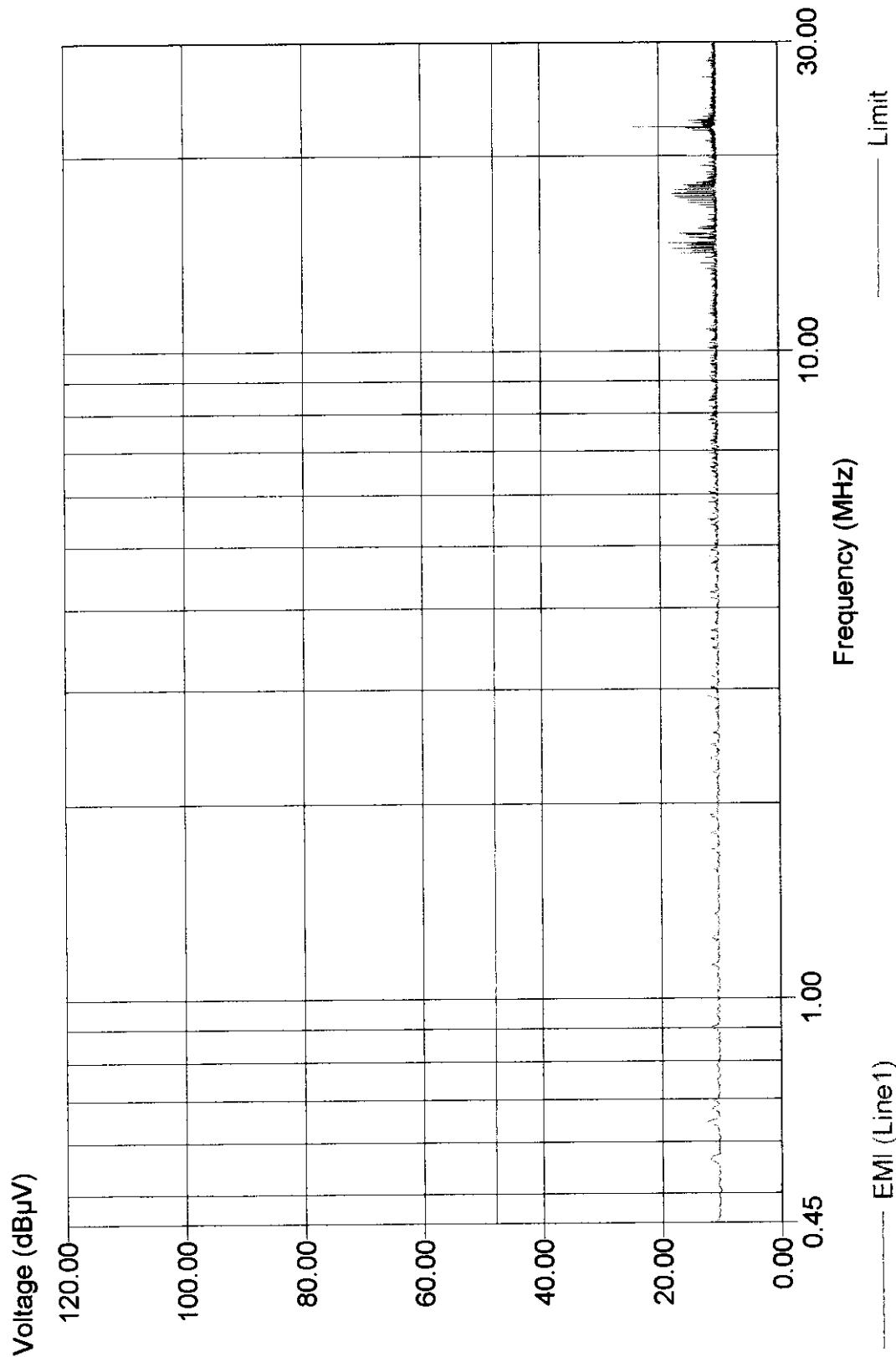
FIGURE 4



Title: Conducted Emissions  
File: W002N.SET  
EUT Type: Telko M/N: W002, Transmitter (-12VDC) Conductor  
Operator: JM

06/22/99  
Sequence: Preliminary Scan

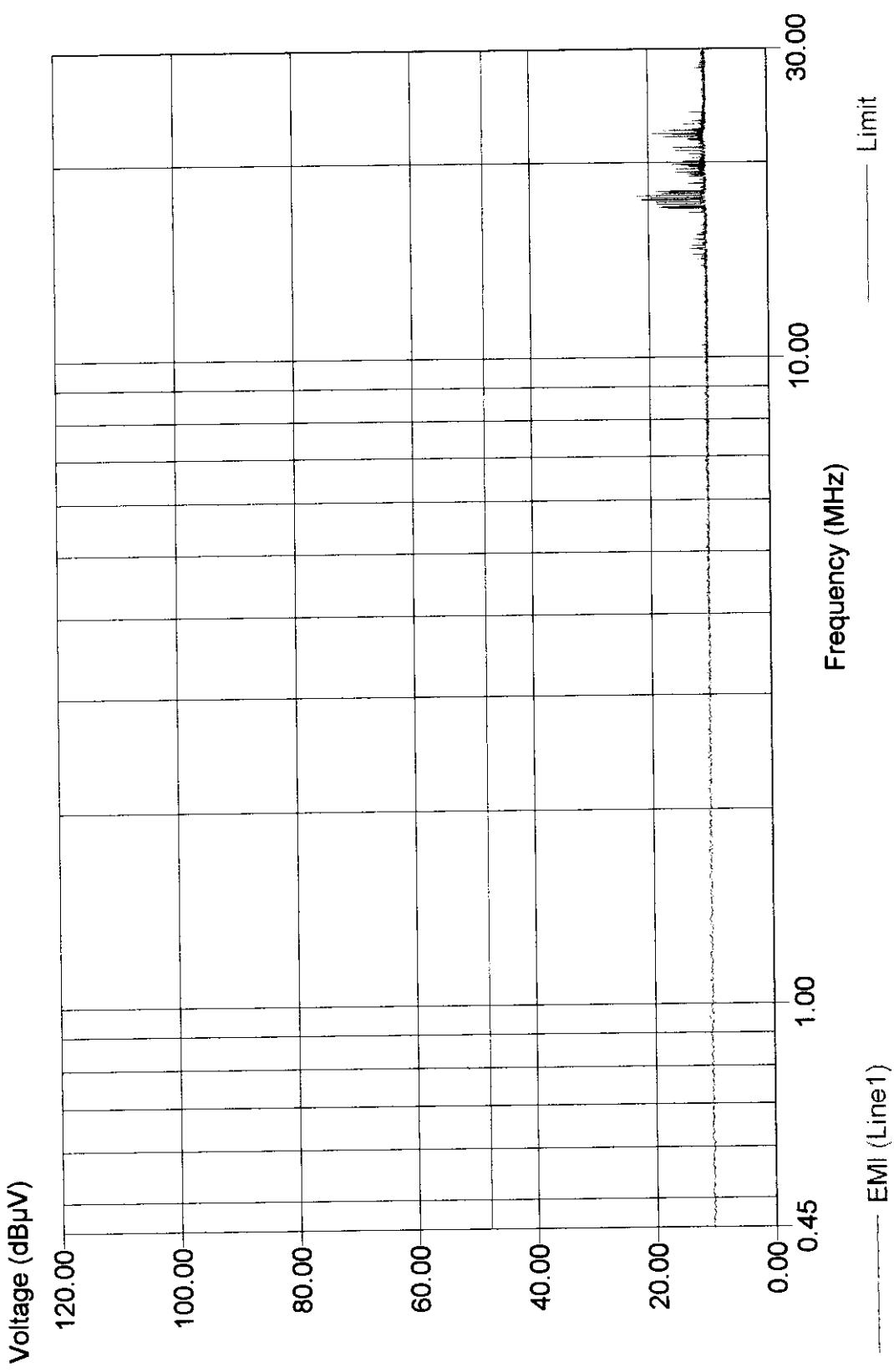
FIGURE 5



Title: Conducted Emissions  
File: W004L.SET  
EUT Type: Telko M/N: W004, Transmitter (+12VDC) Conductor  
Operator: JM

06/23/99  
Sequence: Preliminary Scan

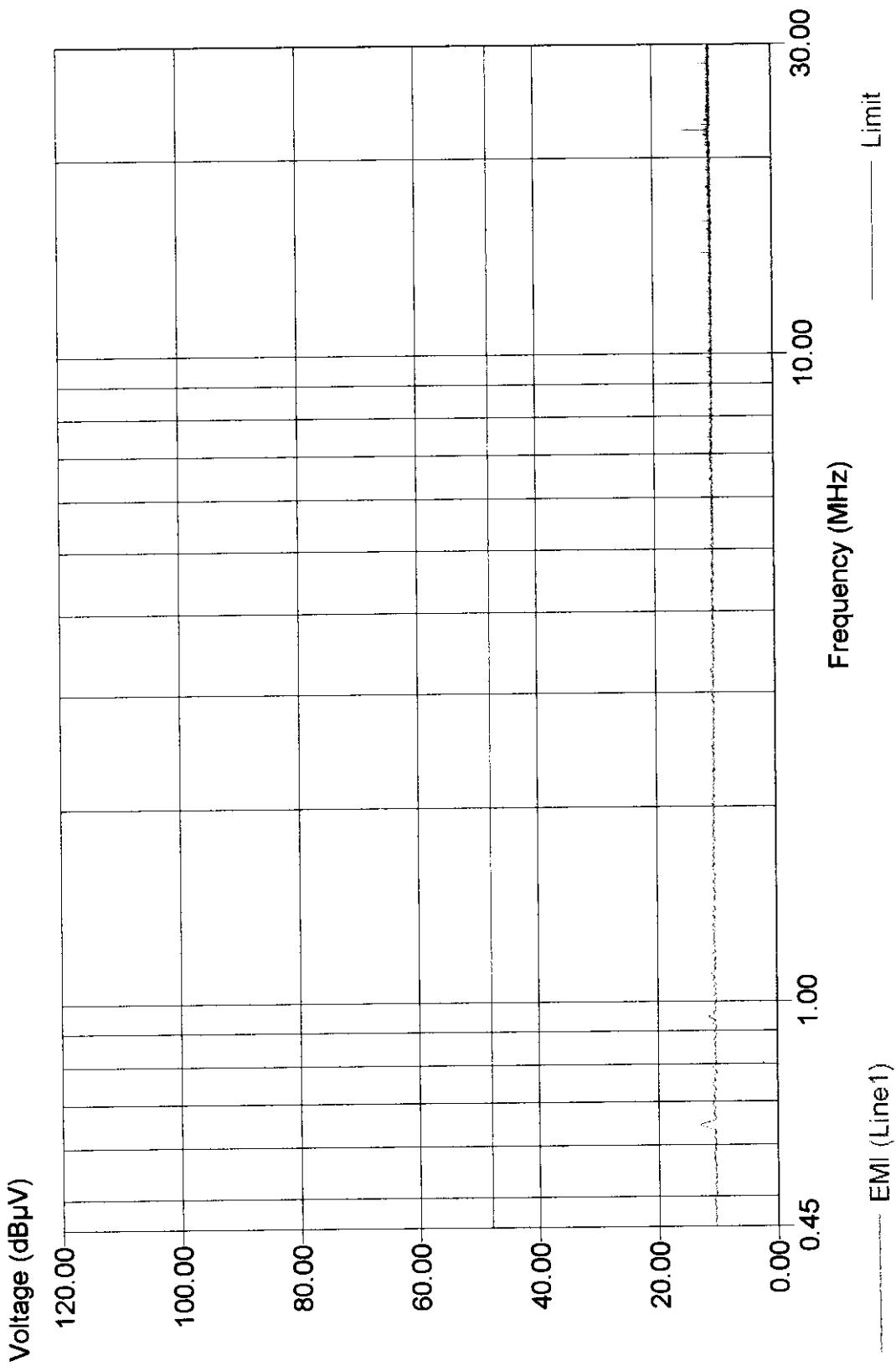
FIGURE 4



Title: Conducted Emissions  
File: W004N.SET  
EUT Type: Telko M/N: W004, Transmitter (-12VDC) Conductor  
Operator: JM

06/23/99  
Sequence: Preliminary Scan

FIGURE 5



## **5.0 Occupied Bandwidth Plot**

The following plots shows the occupied bandwidth of the modulated carrier of the transmitter.

Requirement is specified in FCC 15.231(c):

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHZ and below 900 MHZ.

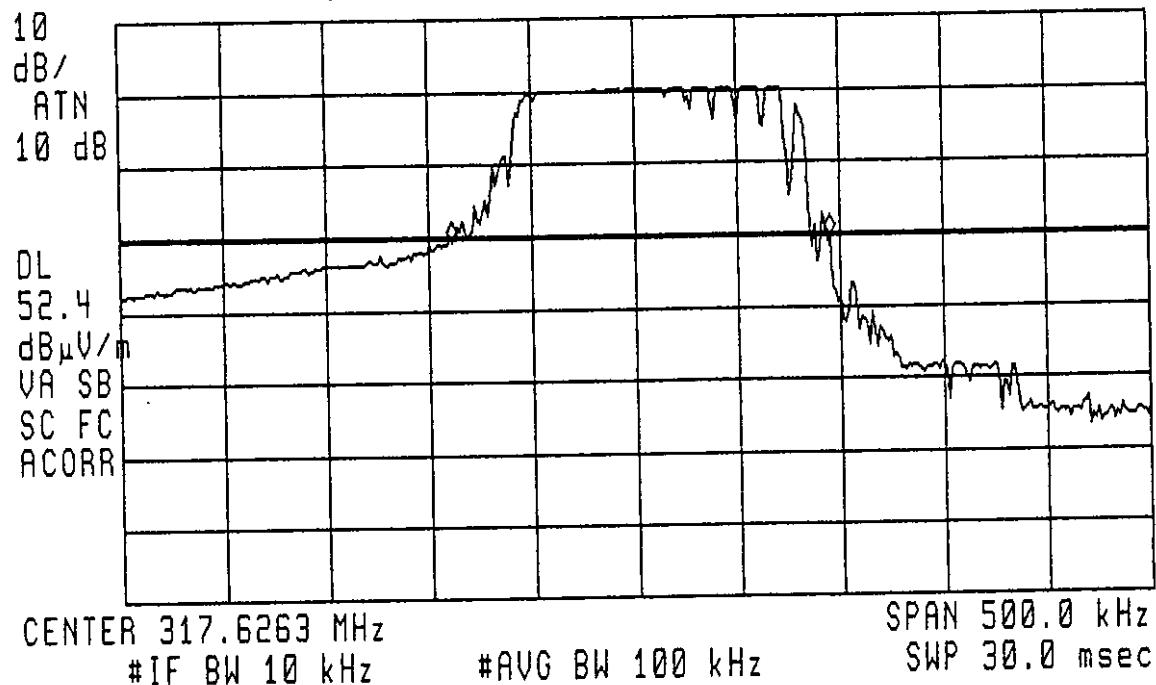
Test result: Pass.



W001

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 183.8 kHz  
.37 dB

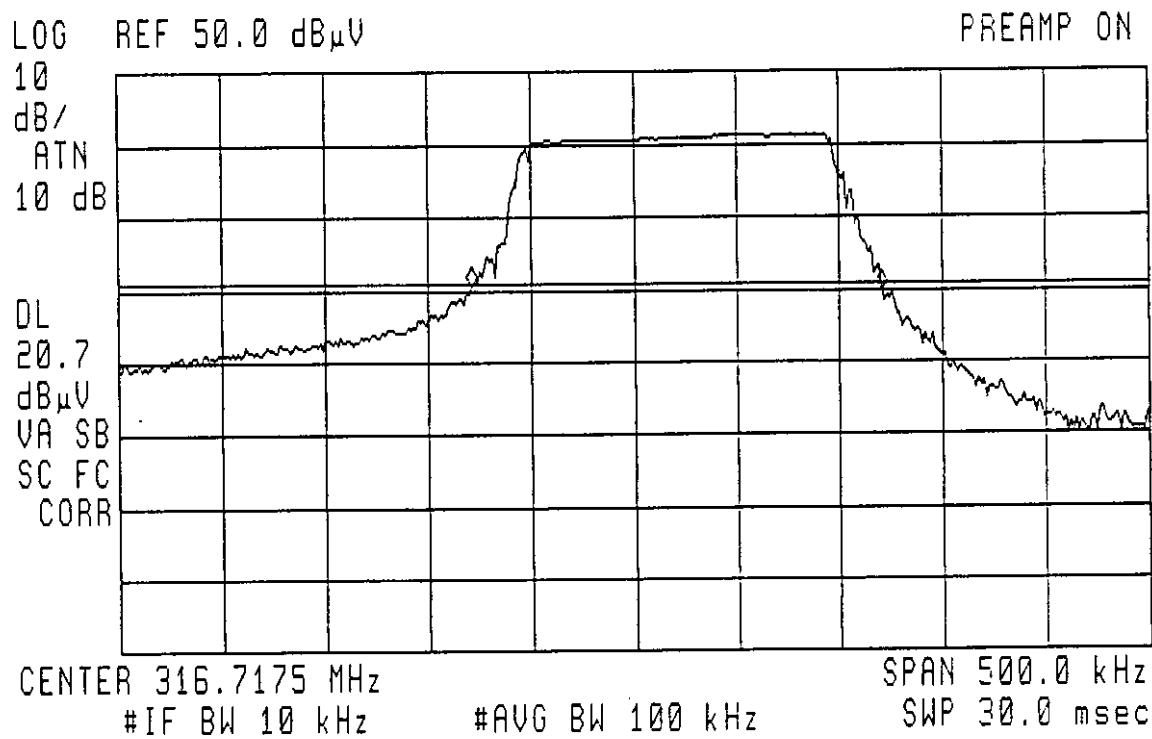
LOG REF 82.4 dB $\mu$ V/m



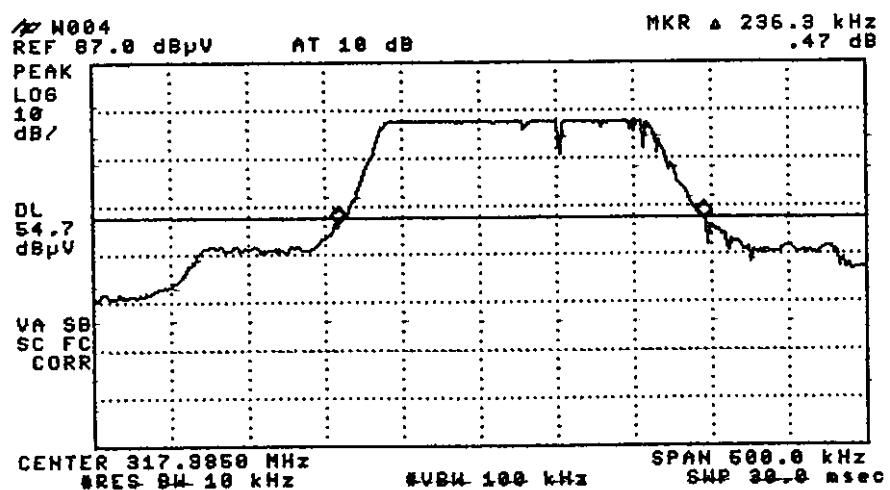
Model W001  
Occupied Bandwidth

W002

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 198.8 kHz  
-74 dB



## Model W002 Occupied Bandwidth



Model W004  
Occupied Bandwidth

## **6.0 Transmitter Duty Cycle Calculation and Measurement**

The following 9 plots show the duty cycle of the transmitting signal.

The worst case duty cycle:

Model W001: -9.6 dB

Model W002: -9.5 dB

Model W004: -9.4 dB

According to FCC 15.35:

Duty Cycle = Maximum on time / One complete pulse train, including blanking intervals (as long as the pulse train does not exceed 0.1 seconds).

Duty Cycle correction factor, dB =  $20 \times \log (DC)$

See attached spectrum analyzer chart(s) for transmitter timing.

See transmitter timing diagram provided by manufacturer.



W001

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 20.925 msec  
.04 dB

LOG REF 82.4 dB $\mu$ V/m

10

dB/

ATTN

10 dB

VA SB

SC FC

ACORR

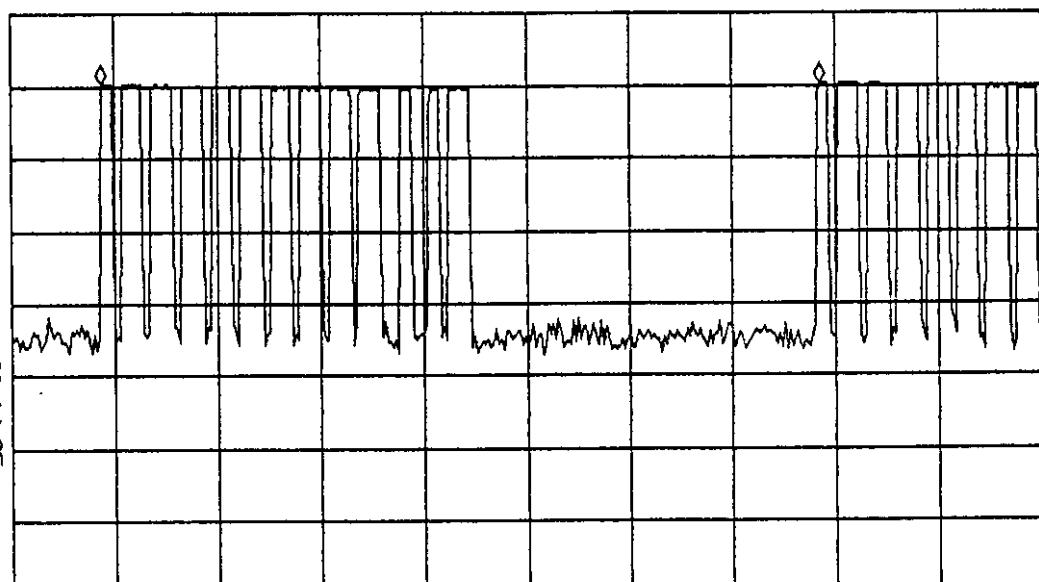
CENTER 317.626 MHz

#IF BW 1.0 MHz

#AVG BW 3 MHz

SPAN 0 Hz

SWP 30.0 msec



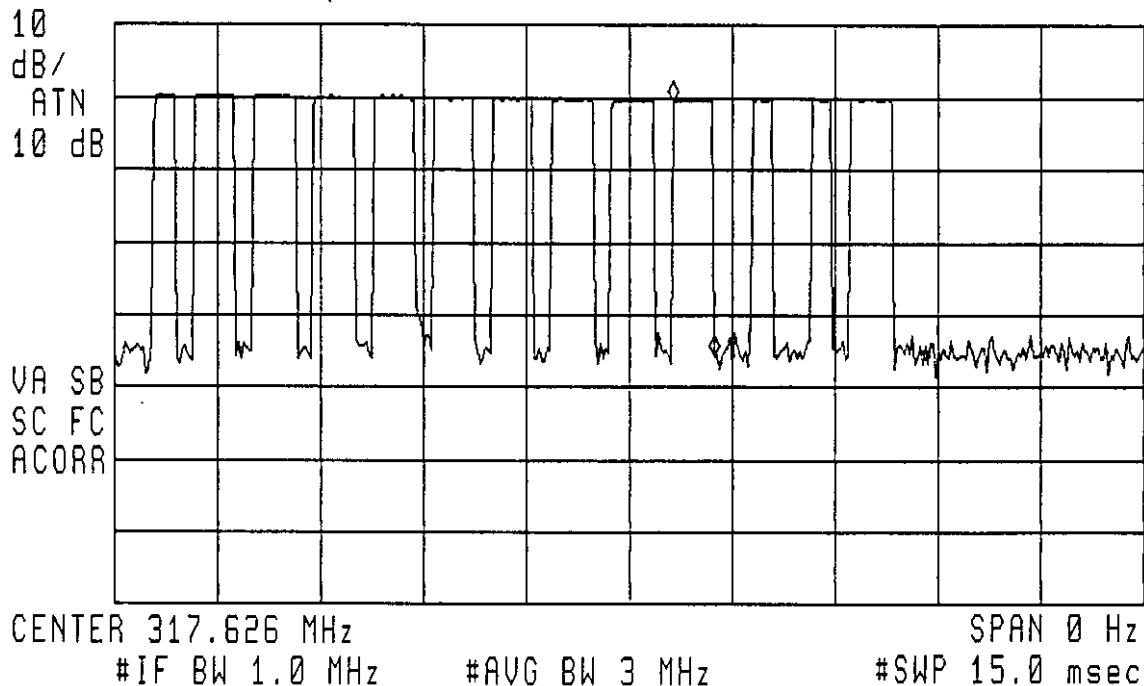
Model W001  
Duty Cycle Measurement Plot 1



W001

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 600.00  $\mu$ sec  
-35.33 dB

LOG REF 82.4 dB $\mu$ V/m



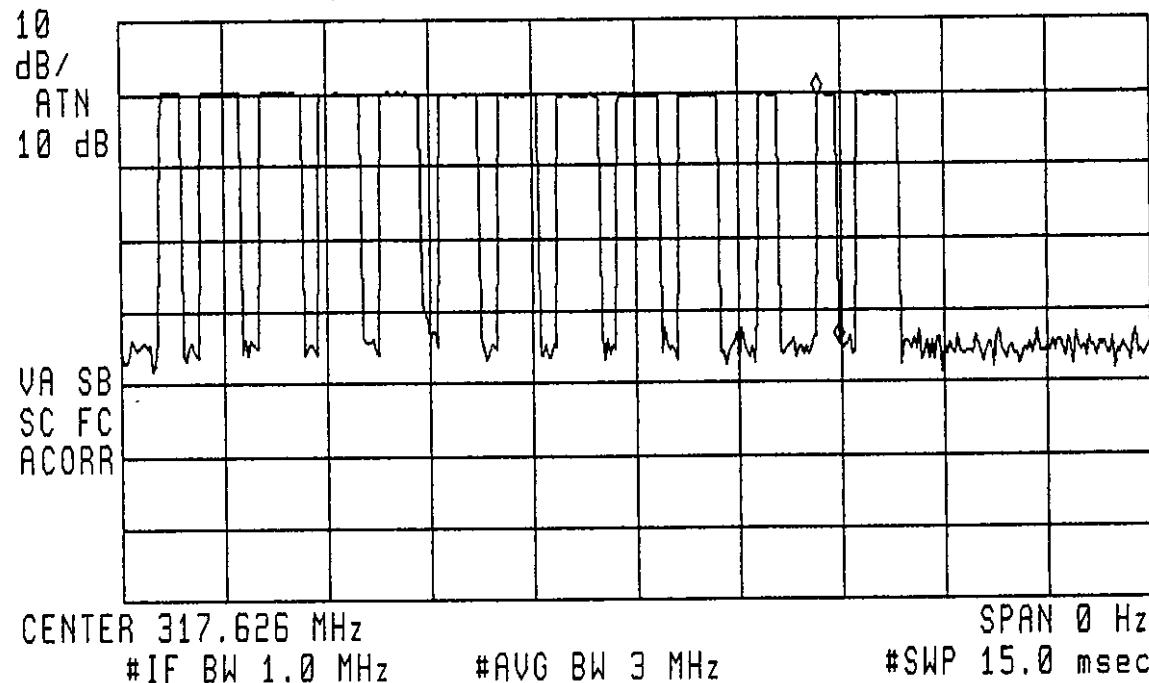
Model W001  
Duty Cycle Measurement Plot 2



W001

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 300.00  $\mu$ sec  
-34.29 dB

LOG REF 82.4 dB $\mu$ V/m

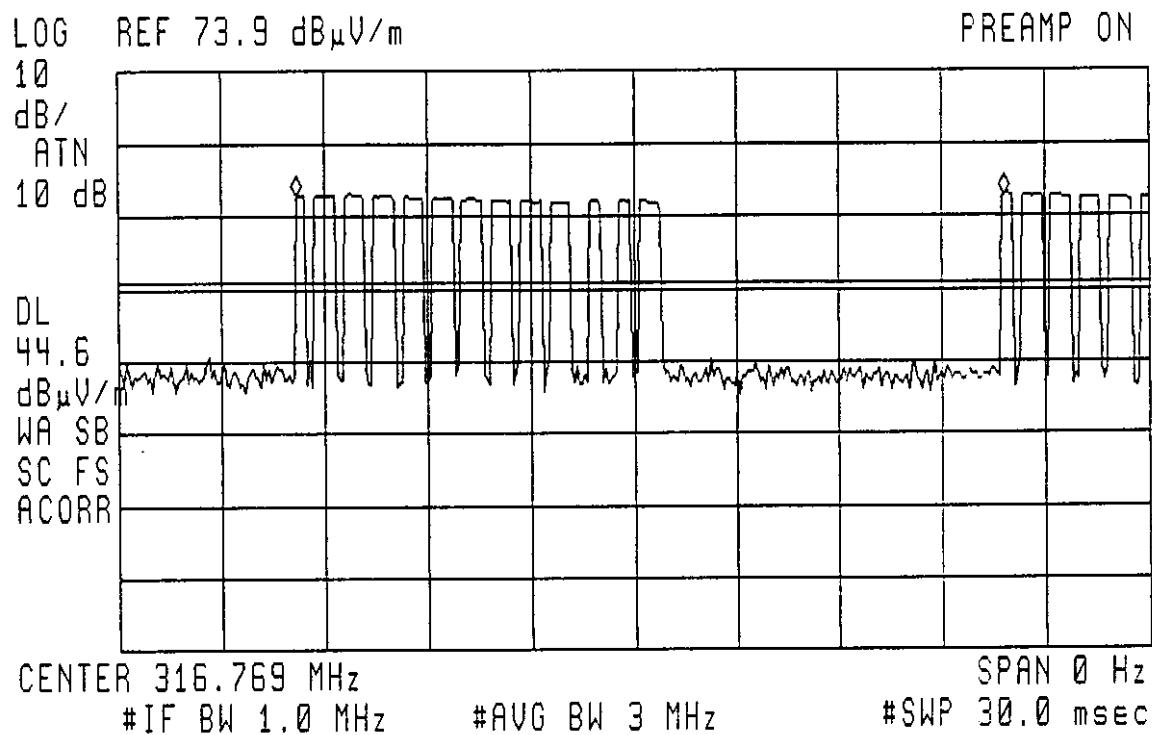


Model W001  
Duty Cycle Measurement Plot 3



W002

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 20.625 msec  
-.05 dB



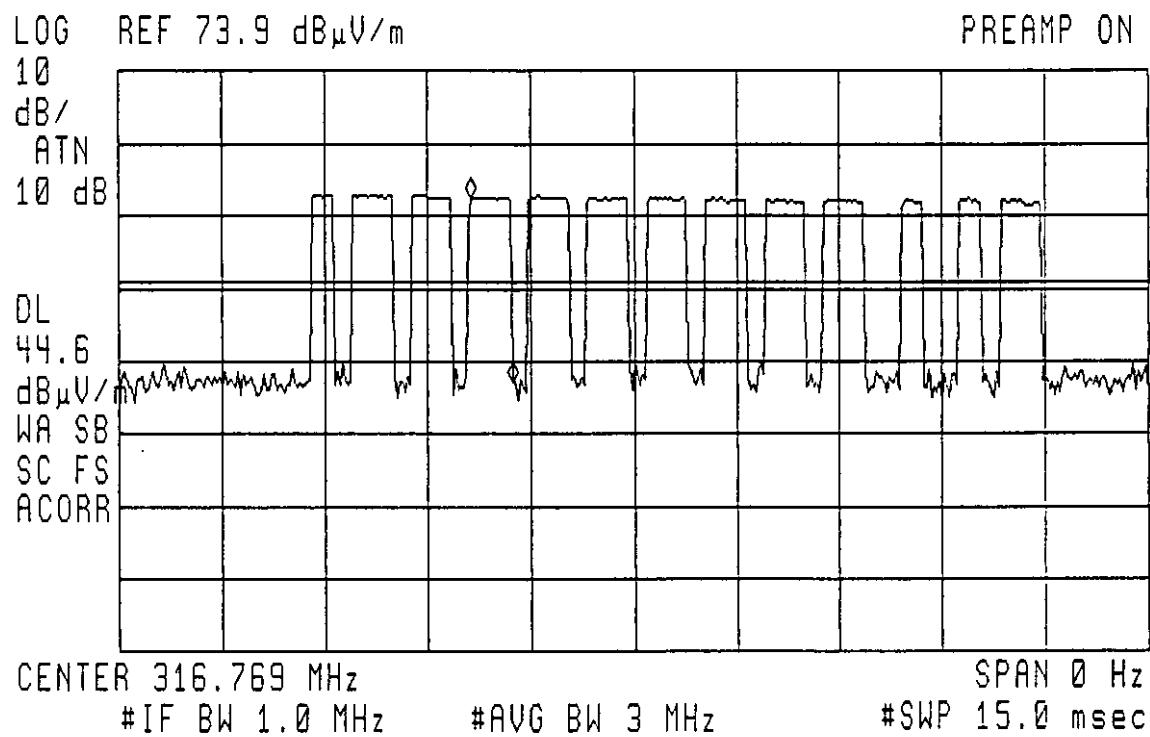
Model W002  
Duty Cycle Measurement Plot 1

# Intertek Testing Services



W002

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 600.00  $\mu$ sec  
-25.33 dB

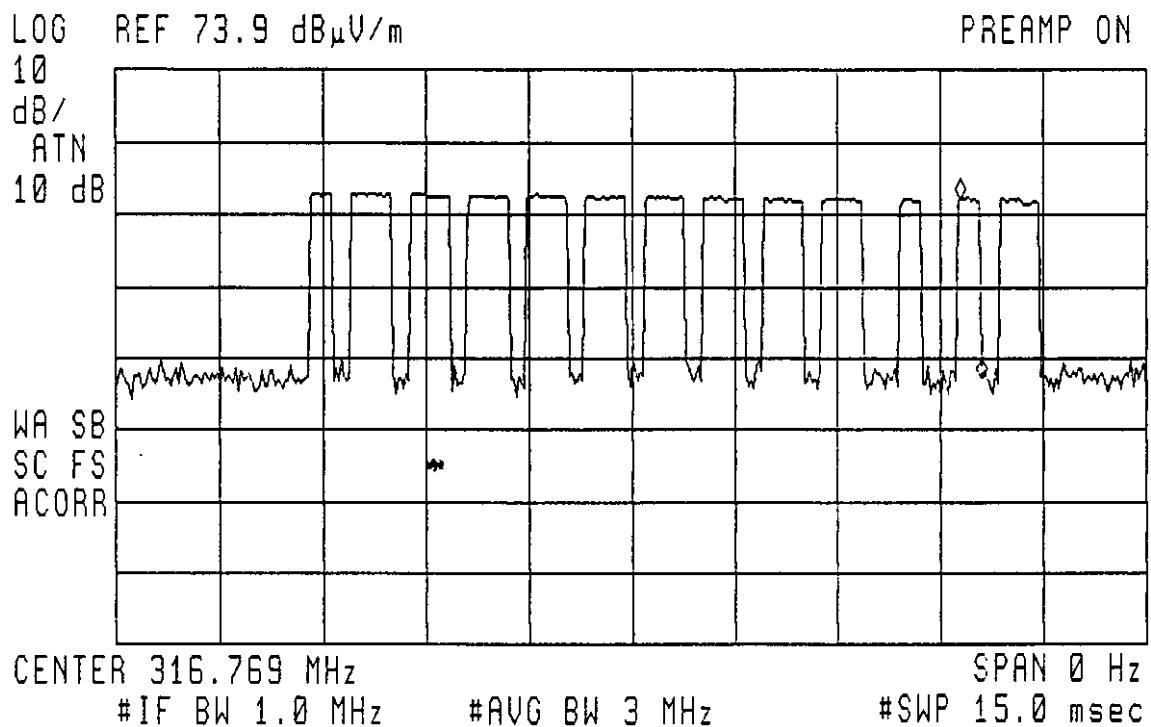


**Model W002**  
**Duty Cycle Measurement Plot 2**

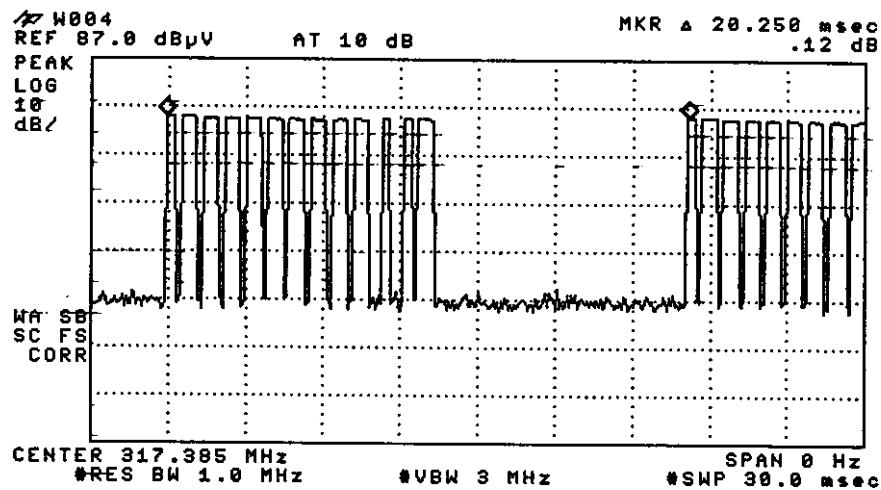


W002

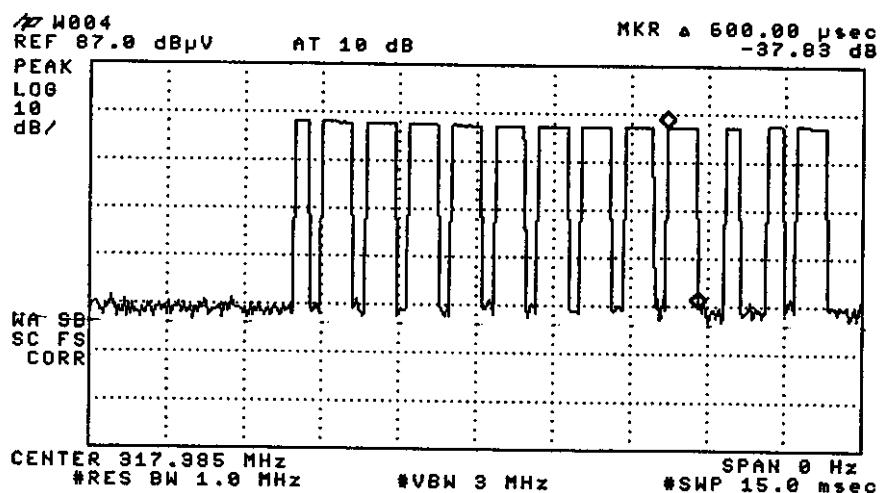
ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR<sub>A</sub> 300.00  $\mu$ sec  
-25.21 dB



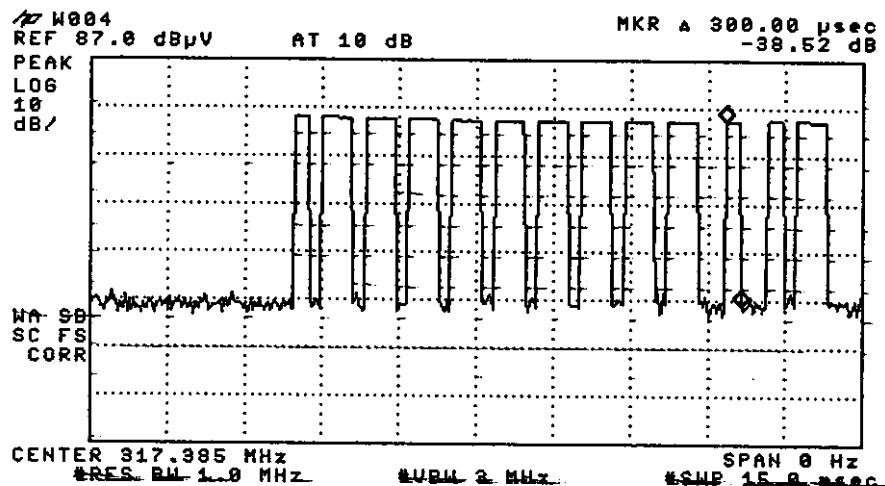
**Model W002**  
**Duty Cycle Measurement Plot 3**



Model W004  
Duty Cycle Measurement Plot 1



Model W004  
Duty Cycle Measurement Plot 2



Model W004  
Duty Cycle Measurement Plot 3

## **7.0 Antenna Requirement**

The EUT uses a permanently connected antenna.