Test Report

of an Intentional Radiator for Certification under Part 15.231 of the FCC rules

DUT:	Remote Control Transmitter
FCC ID	SNA-5125-5132
Test Date:	21-October-2004

Manufacturer:	Woodstream Corporation 69 North Locust St. Lititz, PA 17543 (717) 626-2125
Conducted at:	Carl T. Jones site #90490 Springfield, VA
Prepared by:	Control Design & Testing, Inc. 6010 Red Fox Drive Spotsylvania, VA 22553 (540) 582-2826

A. DEVICE UNDER TEST

The device is a handheld, five button transmitter used to control the circuitry in a electronic dog collar as part of a remote training system. This product is designed to operate under the provisions of Part 15.231 of the FCC rules and RSS-210 in Canada.

The frequency of operation is 303.825 MHz., nominal. The modulation mode is on/off pulse keying using binary code in Manchester format. The test samples were supplied in the final production plastic enclosure.

The device is powered by an internal, rechargable battery pack and regulated at 3.3 volts DC. When the charging transformer is connected, the rf and controller circuits are disabled and the device cannot transmit.

The transmitter circuit is comprised of an RF Monolitihics TR5003 hybrid IC, a two element inductive matching network and a formed steel wire antenna. The antenna is hard soldered to the circuit board. There is no provision to connect an external antenna.

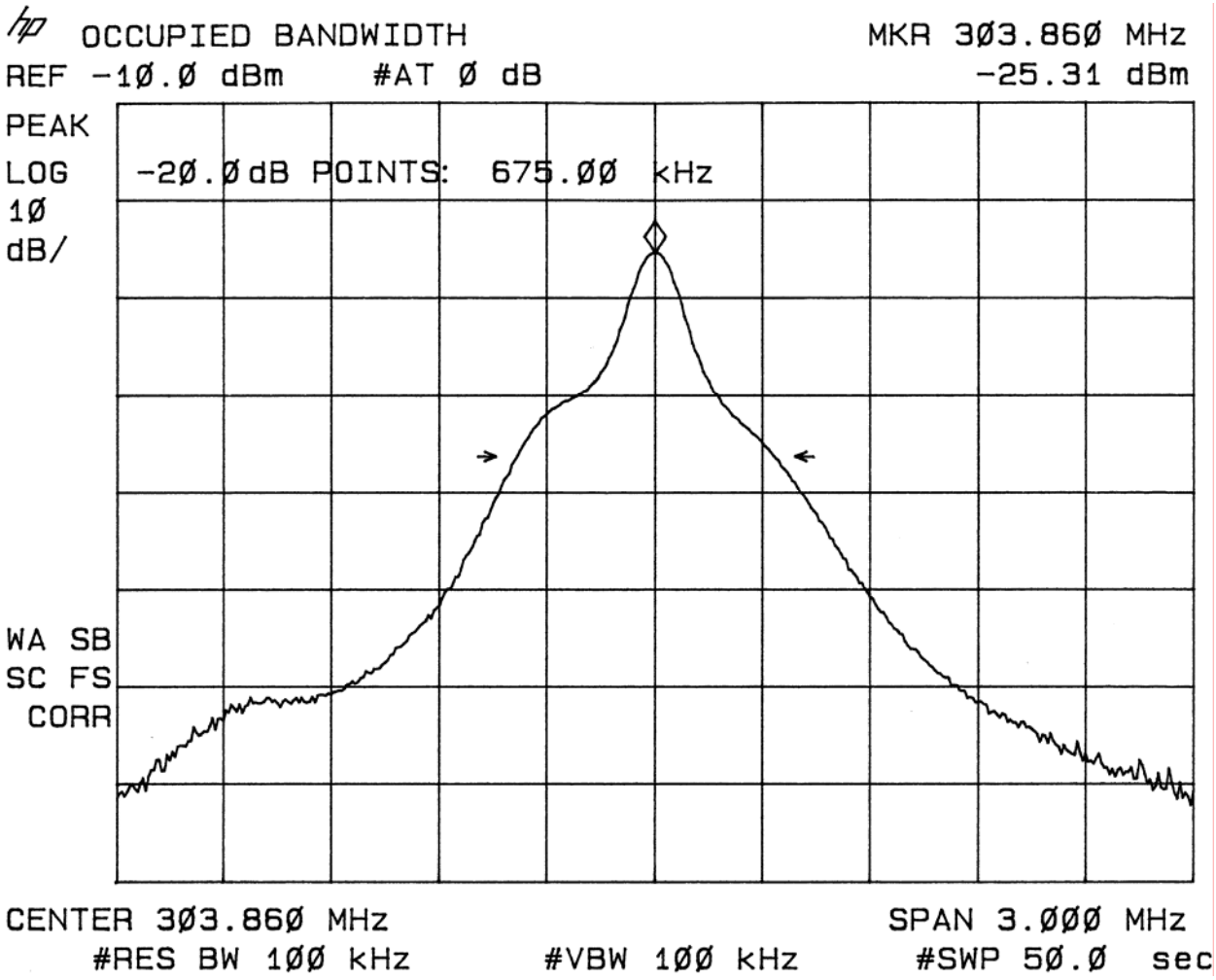
B. MEASUREMENT: RADIATED EMISSIONS

Radiated emissions testing of this device was conducted at the Carl T. Jones test facility located in Springfield, Virginia. FCC Site #90490; IC Site #3101.

The field strength measurements were conducted according to the procedures set forth in ANSI C63.4 (1992). The device under test was placed on a rotating turntable 0.8 meters high, centered at 3 meters distant from the measurement antenna. The device was placed in the center of the turntable and tested in the positions shown in the test setup photographs

In normal operation, this device is programmed to transmit when any of the four control buttons is depressed and stops transmitting immediately when the button is released. However, transmission will cease automatically after ten seconds if the button is not released. For the purpose of radiated emissions testing, the test sample was specially programmed to continuously transmit its normal code sequence after pressing the “ON” button. The occupied bandwidth plot below (Plot 1) was captured using this signal. The occupied bandwidth limit for this frequency is 759.56 KHz.

Plot 1


OCCUPIED BANDWIDTH
MKR 3Ø3.86Ø MHz
REF -1Ø.Ø dBm
#AT Ø dB
-25.31 dBm
PEAK
LOG
1Ø
dB/
-2Ø.Ø dB POINTS: 675.ØØ kHz
WA SB
SC FS
CORR
CENTER 3Ø3.86Ø MHz
SPAN 3.ØØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 5Ø.Ø sec

The field strength measurements were taken using an HP8596E spectrum analyzer, an EMCO 3121C dipole set, an EMCO 3115 double ridge guide horn and an Avantek UJ210 preamp. The device was scanned from 30 MHz. to 4 GHz. and all emissions were noted. The only emissions detected were the primary operating frequency and those harmonically related to the fundamental transmit frequency. The micro-controller is clocked at 32 KHz. but no emissions related to the clock were evident.

At each detected emission frequency, the device was measured by rotating the turntable and adjusting the antenna height over a range of 1 to 4 meters to obtain the maximum output level. This procedure was performed with both horizontal and vertical antenna polarizations for both of the positions shown in the test setup photos. The peak reading for each frequency was recorded in the fourth column in Table 1 below.

Measurements taken for weak emissions were performed by reducing the distance from the measurement antenna to 1 meter and factoring –9.54dB into the calculation. This method was used for the 6^{th} and 7^{th} harmonics.

Table 1

RADIATED EMISSIONS DATA

CLIENT: WOODSTREAM FCC ID: SNA-5125-5132
ANTENNA: DIPOLES/DRG HORN DUT: HANDHELD TRANSMITTER
PART 15.231(a) DATE: 21-OCT-04

Frequency In MHz.	Ant. Polar. H/V	Ant. Factor dB	Peak reading dBm	Duty Cycle -dB	Peak Power uV/m@3m	Corrected Power uV/m@3m	15.231(a) Limit uV/m@3m
303.875	H	20.1	-42.88	12.8	16255	3724	5578
607.750	H	26.4	-84.71	12.8	272	62	578
911.625	H	30.7	-90.53	12.8	228	52	578
1215.500	V	29.2	-91.73	12.8	167	38	500
1519.375	V	31.0	-95.01	12.8	141	32	500
1823.250	V	32.2	-92.24	12.8	223	51	578
2127.125	H	33.8	-102.63	12.8	81	19	578

C. DUTY CYCLE AND INTERVAL CALCULATIONS

The occupied bandwidth and duty cycle measurements were made using an HP8594E spectrum analyzer and plotted with an HP7475A pen plotter. The computation for the duty cycle correction factor for column five in Table 1 is derived from the manufacture's description of the data scheme and is verified by plots 2 through 6.

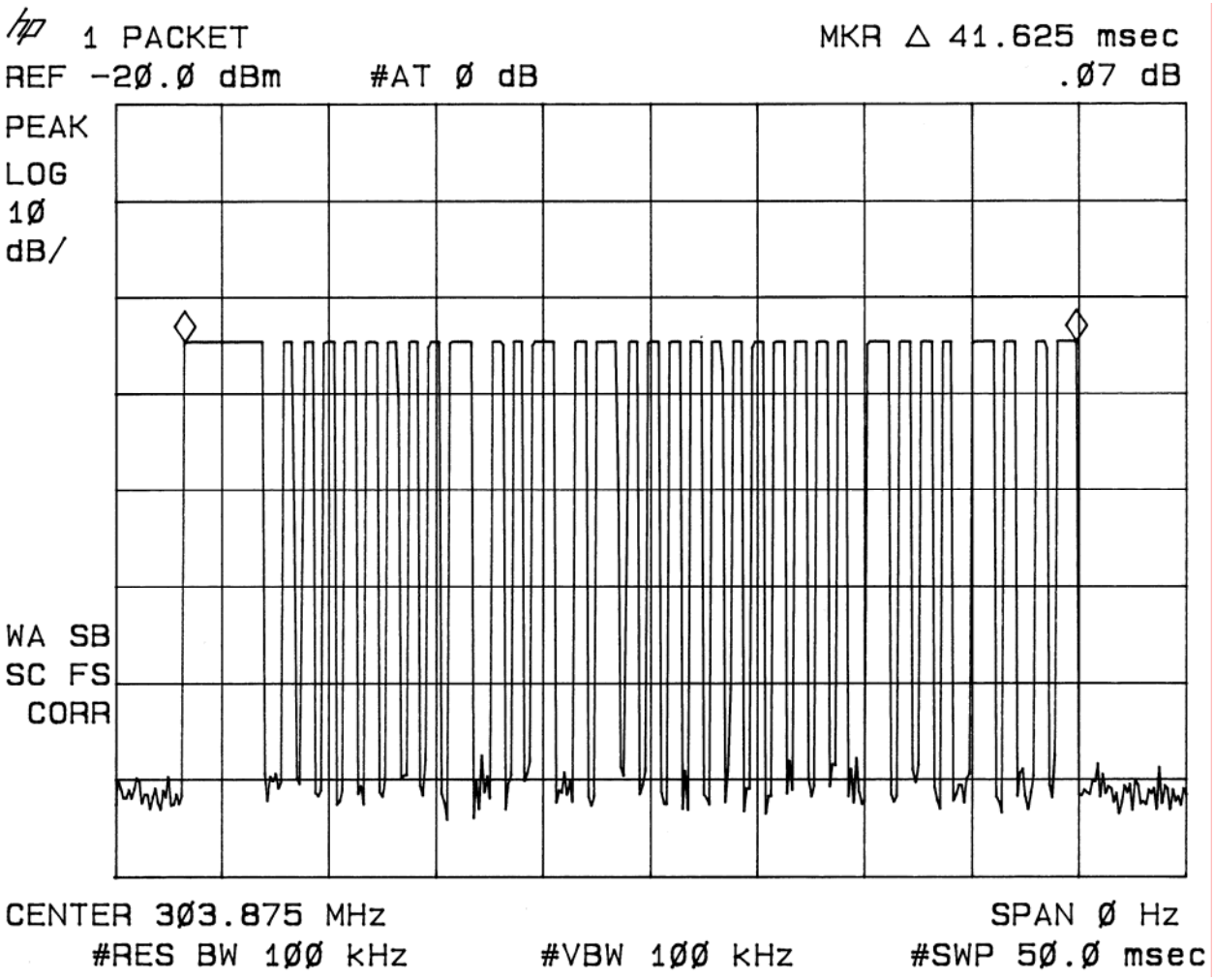
The data format for this device is standard 50% duty cycle Manchester phase consisting of a single 3.8ms. start bit followed by a 490µs. space, then thirty-eight, 980µs. bit frames. Each bit occupies half of the frame or, 490µs. The total on time for the data portion of one packet is 18.62ms. The packets are transmitted at 98.250ms. intervals so there are 1.018 packets in a 100ms time period. The net 100ms. duty cycle is calculated below.

Start bit (3.8ms.) + Packet on time (18.62ms.) X 1.018 = Total on time (22.8235ms.)

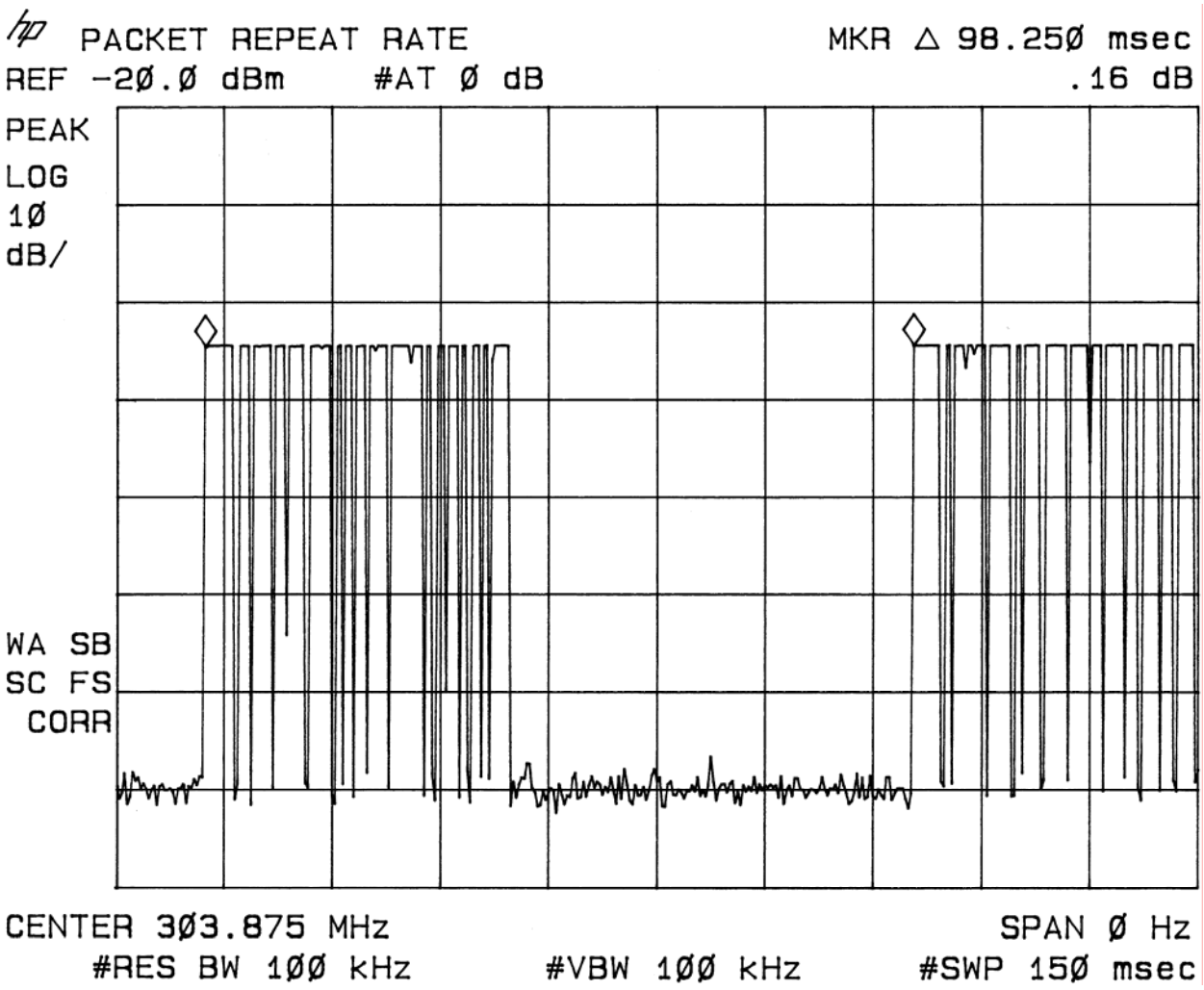
20log (22.8235ms.)/100ms.) = -12.83 dB.

As provided in Part 15.35 of the FCC rules, a correction factor of –12.8 dB is used for the calculations on the data sheet. The duty cycle corrected levels appear in the 7th column in the table above.

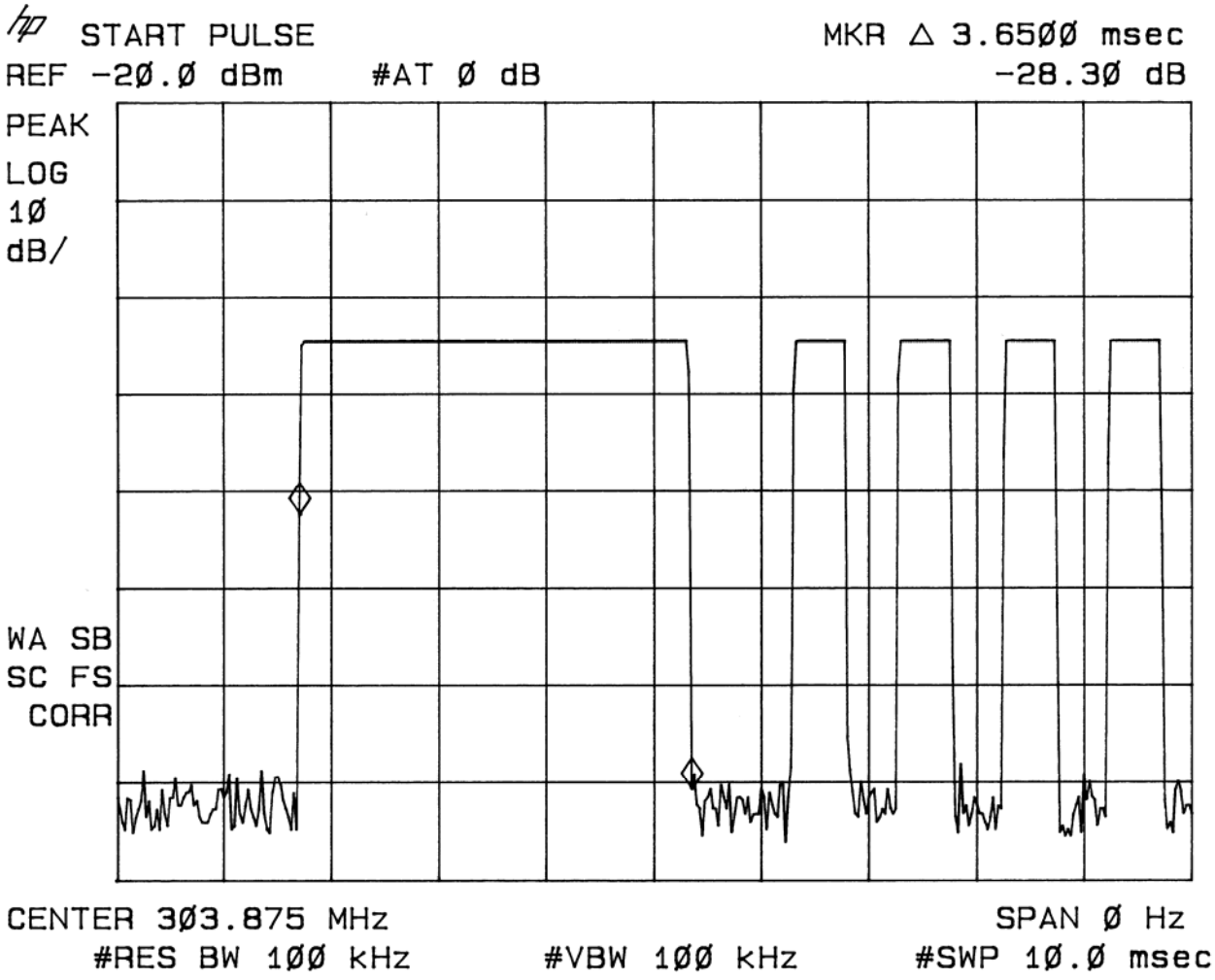
Plot 2


1 PACKET
MKR Δ 41.625 msec
REF −2Ø.Ø dBm
#AT Ø dB
.Ø7 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 3Ø3.875 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 5Ø.Ø msec

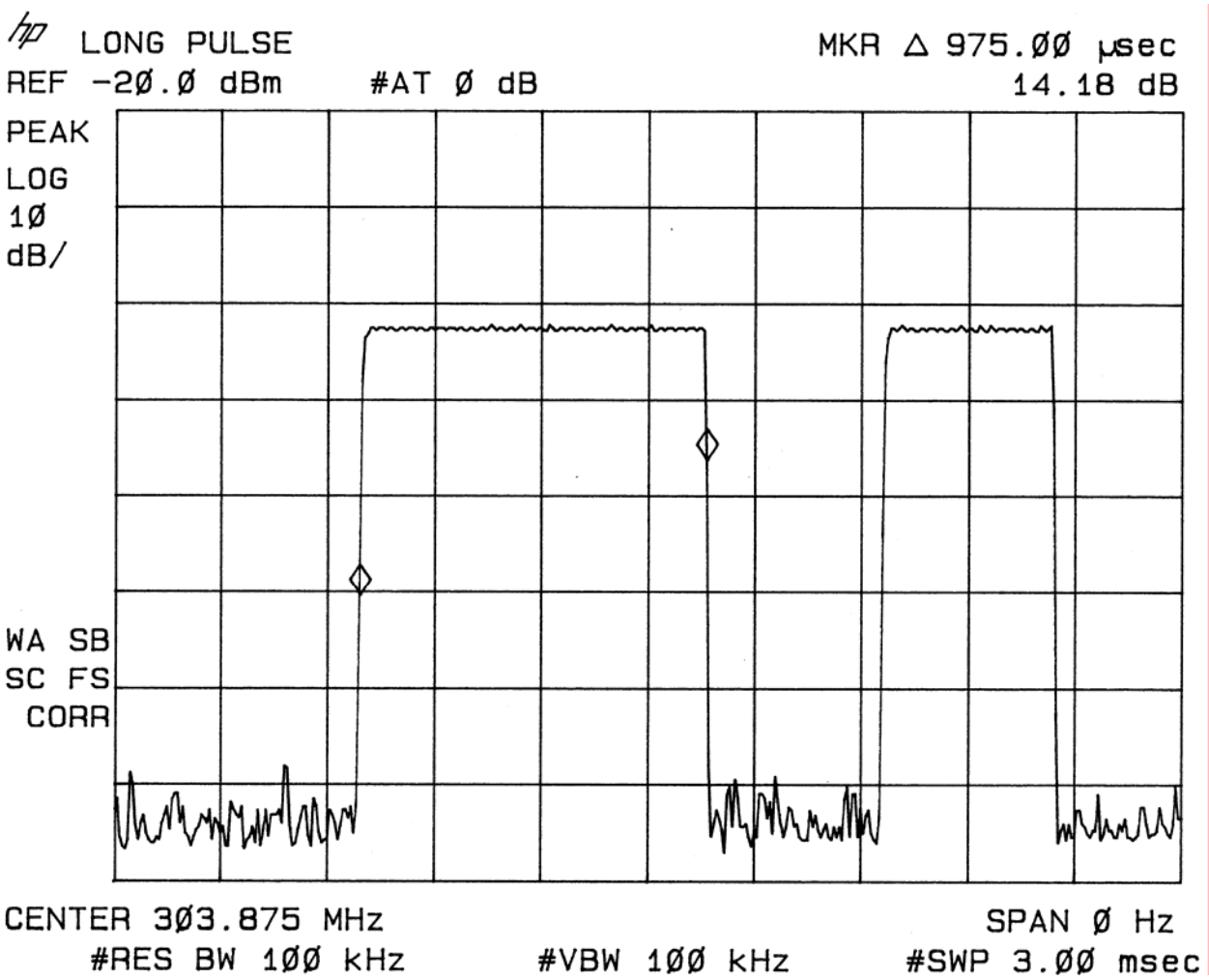
Plot 3


PACKET REPEAT RATE
MKR Δ 98.25Ø msec
REF −2Ø.Ø dBm
#AT Ø dB
.16 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 3Ø3.875 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 15Ø msec

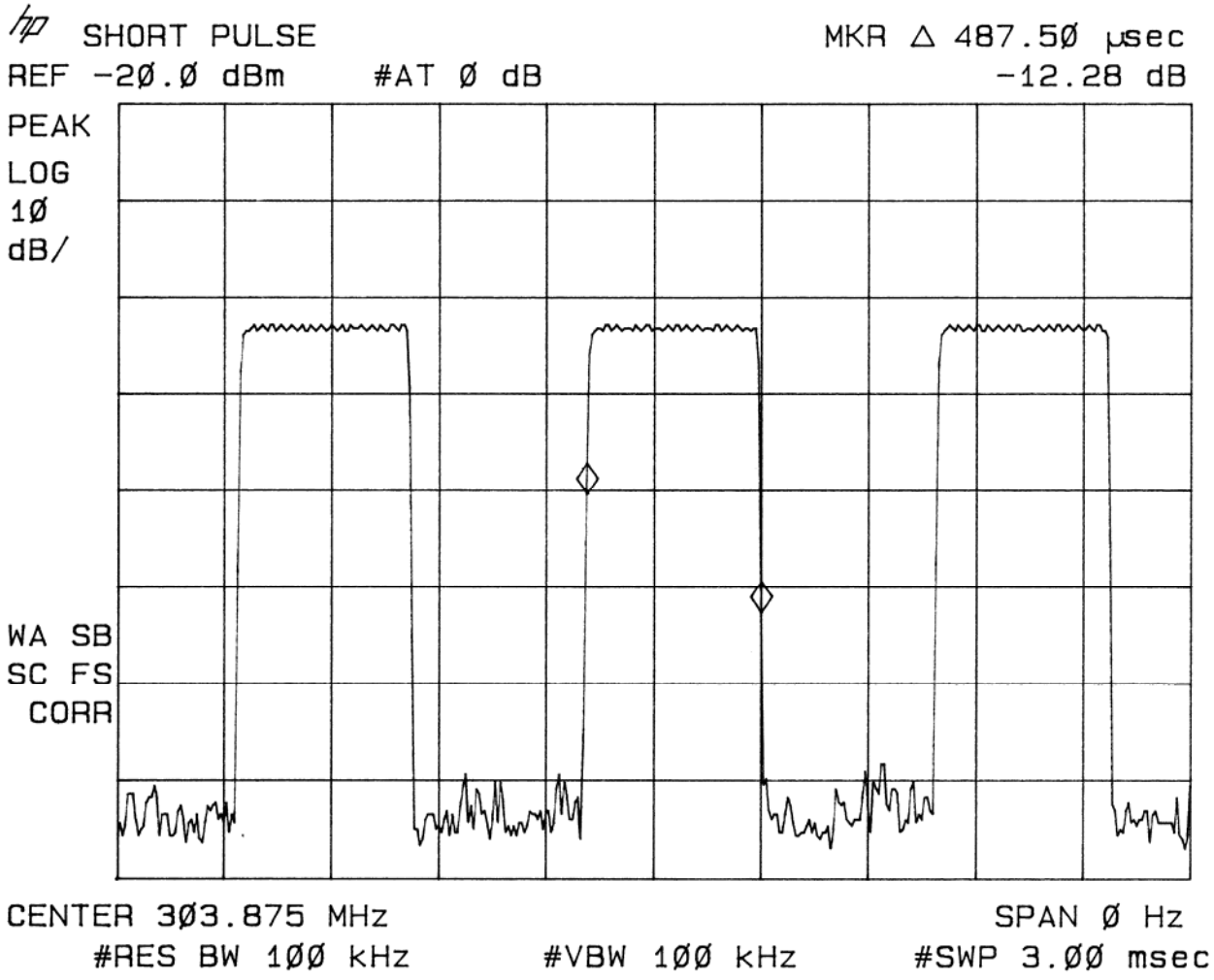
Plot 4


START PULSE
MKR Δ 3.65ØØ msec
REF −2Ø.Ø dBm
#AT Ø dB
−28.3Ø dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 3Ø3.875 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1Ø.Ø msec

Plot 5


LONG PULSE
MKR Δ 975.ØØ µsec
REF −2Ø.Ø dBm
#AT Ø dB
14.18 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 3Ø3.875 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 3.ØØ msec

Plot 6


SHORT PULSE
MKR Δ 487.5Ø µsec
REF −2Ø.Ø dBm
#AT Ø dB
−12.28 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 3Ø3.875 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 3.ØØ msec