Test Report

of an Intentional Radiator for Certification under Part 15 of the FCC rules

DUT:	Wireless keypad
FCC ID	QV4-LRL0001
Model	LRL0001
Date:	4-Feb-2003

Manufacturer: Enterprise Electronics, L.L.C.
2120 Austin Drive
Rochester Hills, MI 48309
(248) 844-1410

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A. DEVICE UNDER TEST

The product is a transmitter used as keyless access control device for automobiles. This device is similar in function to the popular keyfob transmitters currently offered by Ford Motor Company and works in conjunction with their existing keyless entry receivers. 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 315.00 MHz. nominal. The modulation mode is on/off keying using a proprietary Manchester phase format. In normal operation, this device is programmed to transmit 6 data packets for each activation and ceases transmission within 650ms. of activation The device is powered by an internal BR-2335 size 3 volt lithium coin cell battery.

The rf circuit is a modified colpitts oscillator using a SAW resonator as the frequency determining element. The radiating element is a track antenna printed on the circuit board. . There is no provision to connect an external antenna.

The test sample is in a plastic prototype enclosure. The FCC ID will be embossed in the plastic but for beta units a label will be attached as a temporary measure.

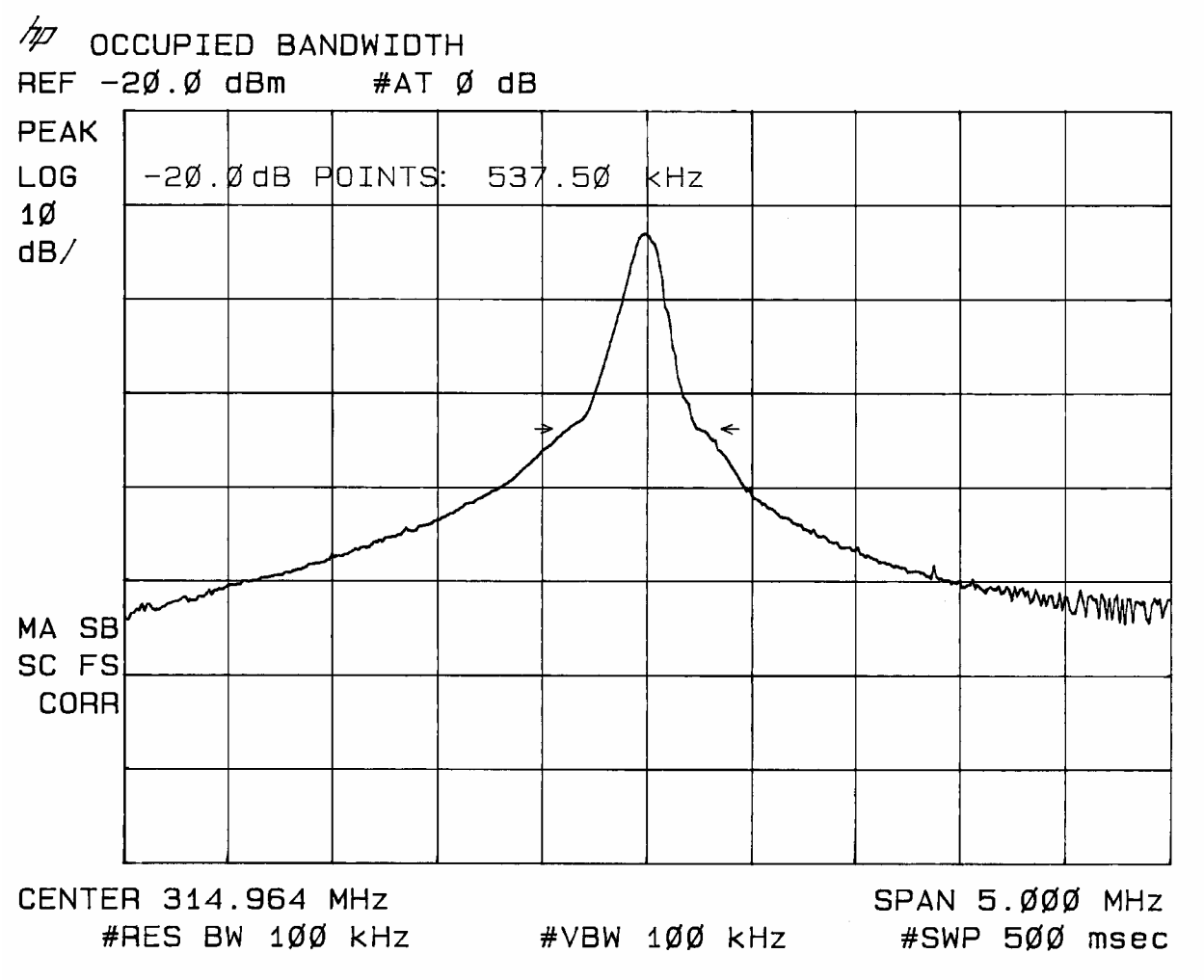
B. MEASUREMENT PROCEDURE: RADIATED EMISSIONS

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

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 three positions as shown in the test setup photographs.

For the purpose of radiated emissions testing, the test sample was specially programmed to continuously transmit a “lock” command signal. The occupied bandwidth (Plot 1) was captured using this signal.

Plot 1


OCCUPIED BANDWIDTH
REF -2Ø.Ø dBm
#AT Ø dB
PEAK
LOG
1Ø
dB/
-2Ø.Ø dB POINTS: 537.5Ø kHz
MA SB
SC FS
CORR
CENTER 314.964 MHz
SPAN 5.ØØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 5ØØ msec

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 5 GHz. and all emissions were noted. In this case, the only emissions detected were those harmonically related to the fundamental transmit frequency.

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 each of the test 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 10th harmonic.

Table 1

RADIATED EMISSIONS DATA

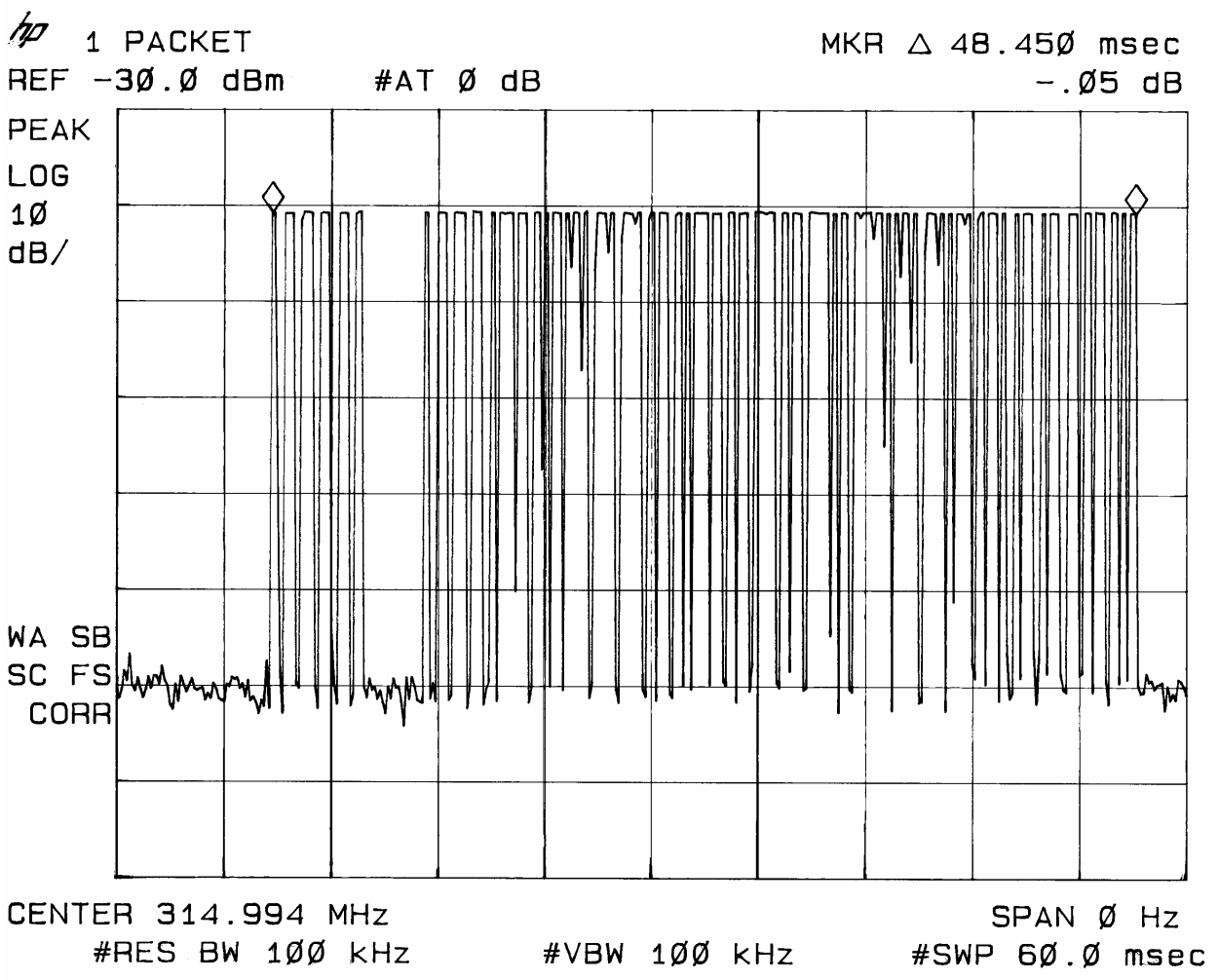
ENTERPRISE ELECTRONICS, LLC FCC ID: QV4-LRL0001
ANTENNA: DIPOLES/DRG HORN EUT: KEYPAD TRANSMITTER
PART 15.231, 15.35 DATE: 04-FEB-03

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	FCC Limit uV/m@3m
314.967	H	20.3	-39.91	12.9	23415	5303	6041
629.934	H	26.7	-71.87	12.9	1235	280	604
944.901	V	30.9	-76.56	12.9	1167	264	604
1259.868	V	27.6	-89.98	12.9	170	39	604
1574.835	V	28.8	-79.80	12.9	631	143	500
1889.802	V	30.4	-87.02	12.9	330	75	604
2204.769	V	31.1	-87.51	12.9	338	77	500
2519.736	H	32.2	-89.03	12.9	322	73	604
2834.703	H	34.1	-81.76	12.9	927	210	500
3149.669	H	35.4	-89.12	12.9	461	104	604

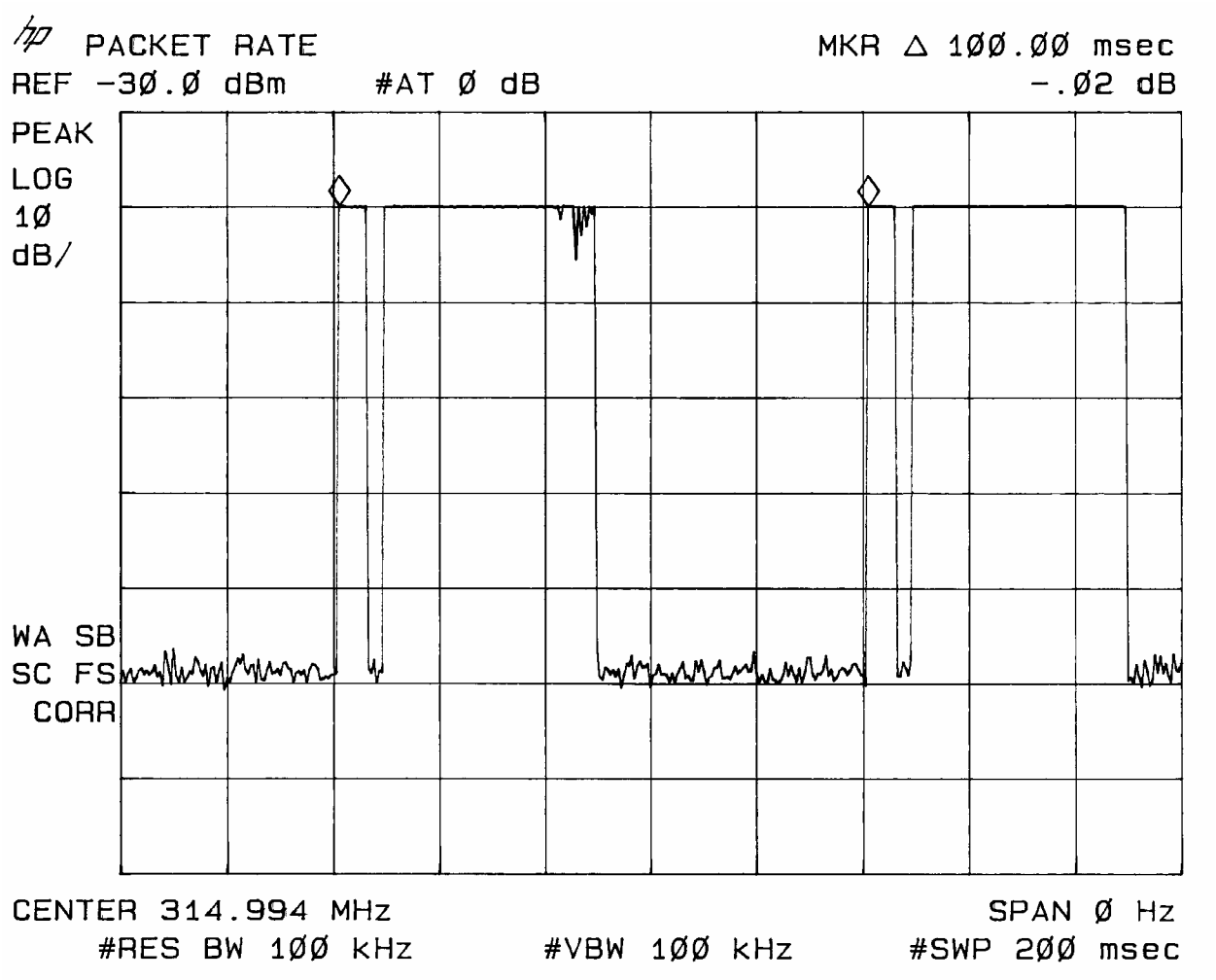
C. DUTY CYCLE AND INTERVAL CALCULATIONS

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 in column five in Table 1 is derived from the manufacture's description of the data scheme and is verified by plots 2 through 7.

Plot 2



Plot 3



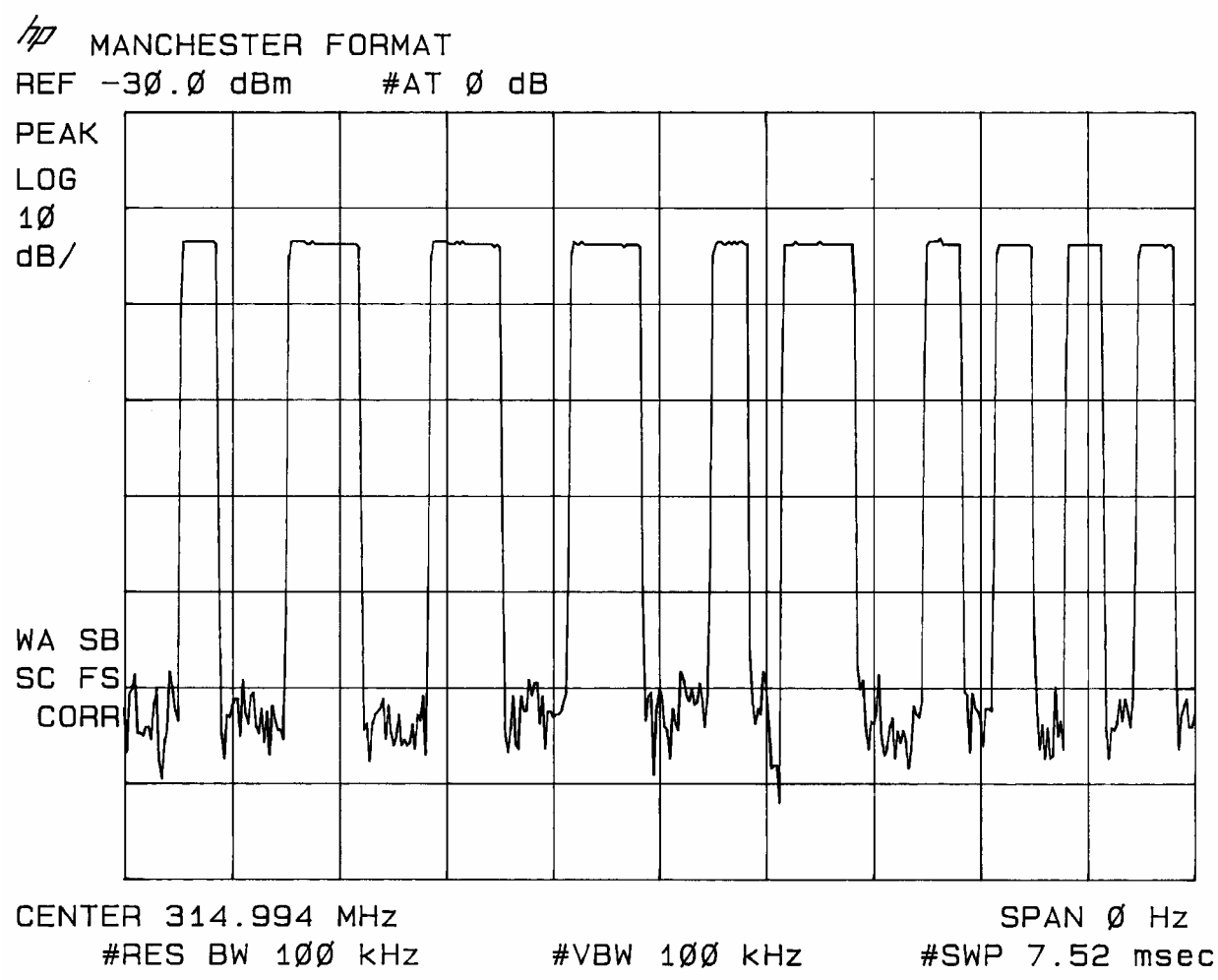
The code format for this device is a 50% Manchester phase pulse position scheme that comprises 90 bit frames of 500µs. each, divided into preamble and data, separated by a 3.5ms. space. The entire packet length including preamble is 48.5 ms. and is repeated a 100ms. intervals. Measurements of pulse widths have been taken at points at least 6dB below peak to insure worst case. The correction factor is given by:

20log(total on time in ms/100ms.) = -X dB.

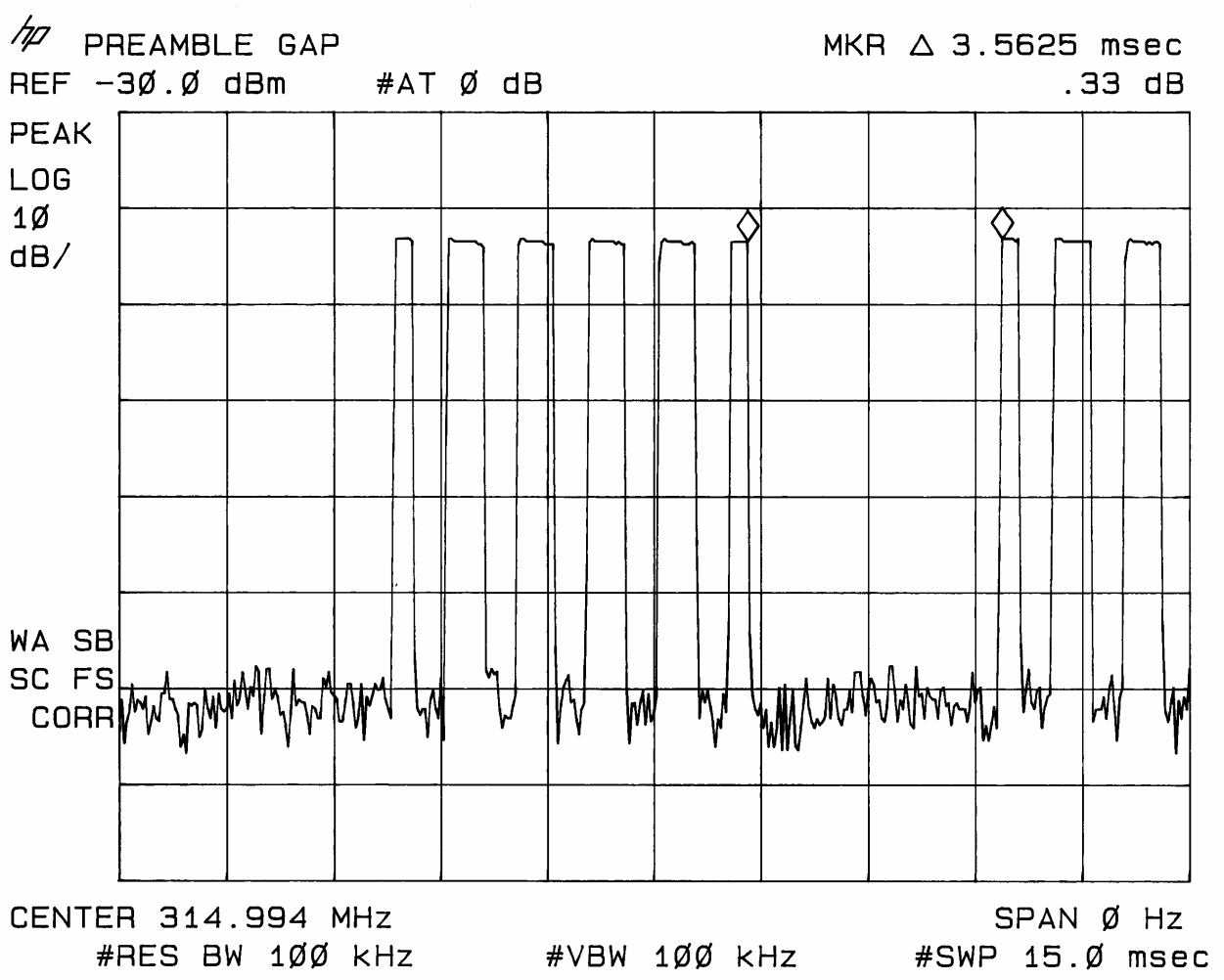
90 bits * 500us. * 0.5 = 22.5ms.
20log(22.5ms./100ms.) = -12.956 dB.

As provided in Part 15.35 of the FCC rules, a correction factor of –12.9 dB is used for the calculations on the data sheet.

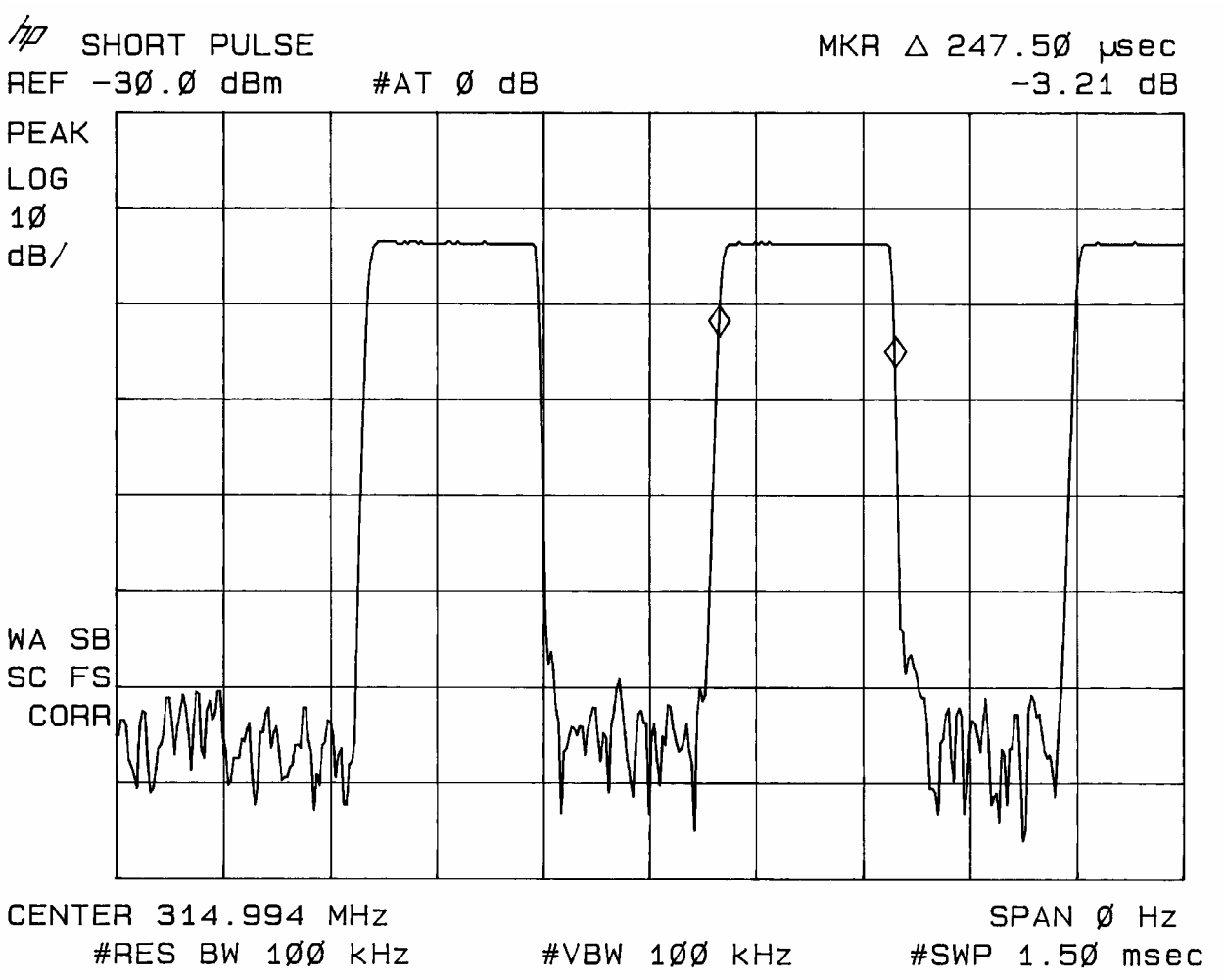
Plot 4



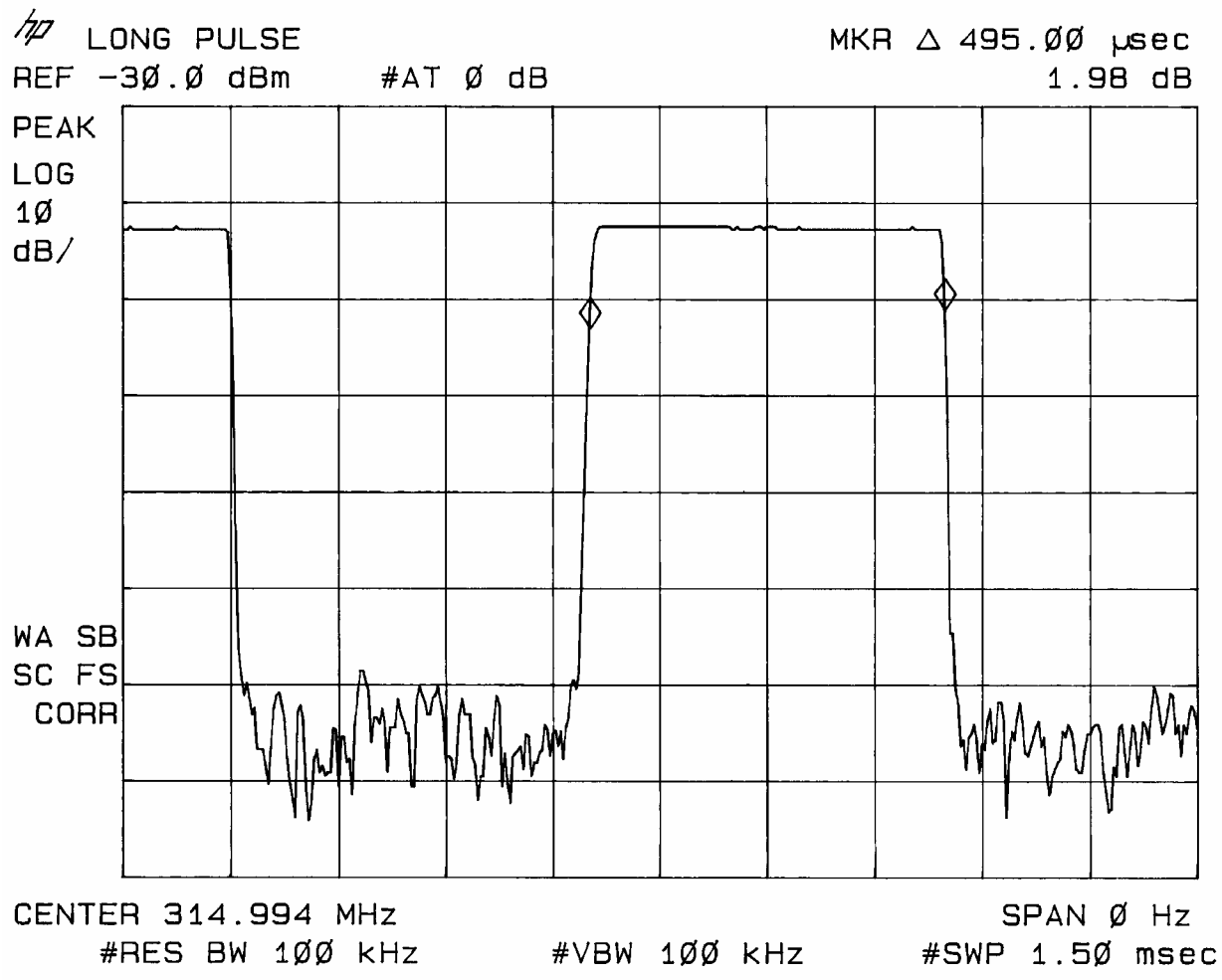
Plot 5


PREAMBLE GAP
MKR Δ 3.5625 msec
REF -3Ø.Ø dBm
#AT Ø dB
.33 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 314.994 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 15.Ø msec

Plot 6


SHORT PULSE
MKR Δ 247.5Ø µsec
REF -3Ø.Ø dBm
#AT Ø dB
-3.21 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 314.994 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1.5Ø msec

Plot 7


LONG PULSE
MKR Δ 495.ØØ µsec
REF −3Ø.Ø dBm
#AT Ø dB
1.98 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 314.994 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1.5Ø msec