Test Report

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

DUT:	Lighting control transceiver
FCC ID	SFJ-WPC-418-3A
Model	WPC-418-3A
Date:	19-August-2004

Manufacturer: Powerweb Technologies, Inc.
415 East Baltimore Pike
Media, PA 19065
(610) 627-9600

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A. DEVICE UNDER TEST

The product is a transceiver used to control commercial and industrial fluorescent lighting systems. Though operable with standard fixtures, the device was designed specifically as a controller for dimmable fluorescent ballast fixtures. 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 418.00 MHz. nominal. The modulation mode is on/off keying using a compound pulse width format. The device is normally listening in receive mode. There are two events that cause transmission: 1) when a “dim” command is received and 2), when a “bulb out” condition is detected. In the first case, the device will acknowledge the command by transmitting two packets and then return to the receive mode. For the second case, when a “bulb out” is detected, the device will transmit two packets every four hours until the condition is corrected.

The product is rendered on a single board housed in a custom fabricated metal enclosure. The transmitter circuit is a Radiotronix RTC-418-AS SAW based module. The receiver circuit is a Linx RXD-418-KH receiver/decoder module. Both modules are soldered to the circuit board as components. The device is powered from the mains through an onboard a step-down transformer.

The antenna is detachable; constructed from a 1.2 meter length of 174/U coax with 18 centimeters of the braid removed from the end to form a ¼ wave monopole. The exposed center conductor is covered by a clear plastic sleeve secured with heat shrink tubing. The connector is a molded RCA pin type. This device requires professional installation and the prohibitions regarding connectors under 15.203 should not apply.

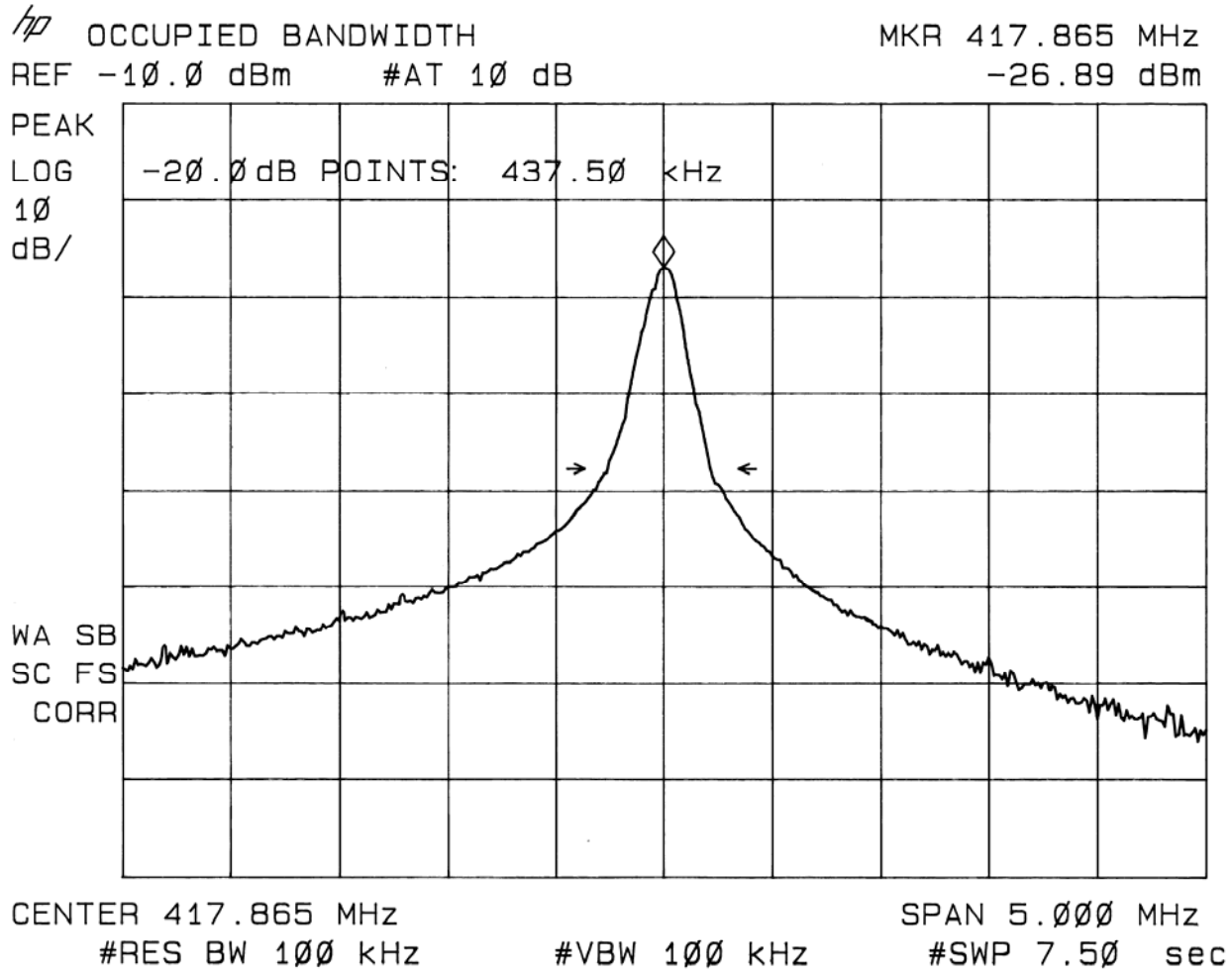
B. MEASUREMENT PROCEDURE: RADIATED EMISSIONS

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

For the purpose of transmit radiated emissions testing; the test sample was specially programmed to continuously transmit a stream of packets at the normal rate and duty cycle. The occupied bandwidth (Plot 1) was captured using this signal.

Plot 1



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.

Table 1

RADIATED EMISSIONS DATA

CLIENT: POWERWEB FCC ID: SFJ-WPC-418-3A
ANTENNA: DIPOLES/DRG HORN EUT: TRANSCIEVER
PART 15.231 DATE: 18-AUG-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	FCC Limit uV/m@3m
417.868	H	22.7	-45.88	4.9	15524	8831	10333
835.736	H	30.2	-85.03	4.9	406	231	1033
1253.604	H	27.6	-83.60	4.9	355	202	1033
1671.472	V	29.3	-81.46	4.9	552	314	500
2089.340	V	31.0	-78.03	4.9	997	567	1033
2507.208	H	32.2	-82.73	4.9	666	379	1033
2925.076	H	33.6	-94.12	4.9	211	120	1033
3342.944	V	34.9	-81.16	4.9	1089	619	1033
3760.812	V	36.1	-92.35	4.9	345	196	500
4178.680	V	37.4	-94.47	4.9	314	178	500

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 5.

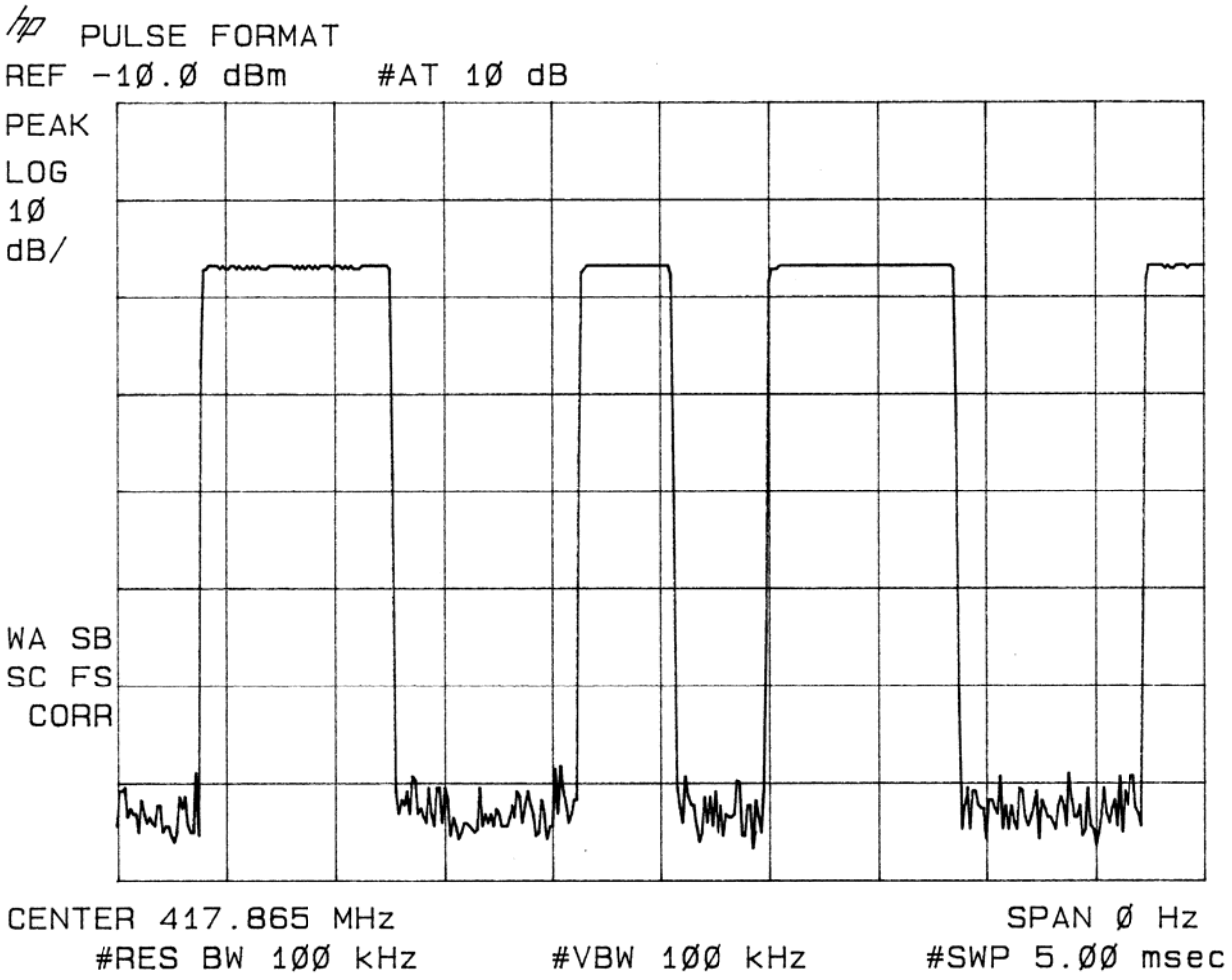
The code format for this device is a compound pulse width (1/3–2/3) scheme consisting of 10 address bits, 8 data bits, 2 sync bits and a start pulse. Each bit is divided into 2 frames, where each frame is in the high state for either 1/3 or 2/3 of the frame length.

The packets are separated by 15ms of dead time leaving 85ms out of any 100ms period occupied by data. The worst case would be packets that consist of all zeros where the on time of each packet would be equal to 66% of the total packet length. That is: all frames with 2/3 high state. Assuming the worst case, the following computation is applied.

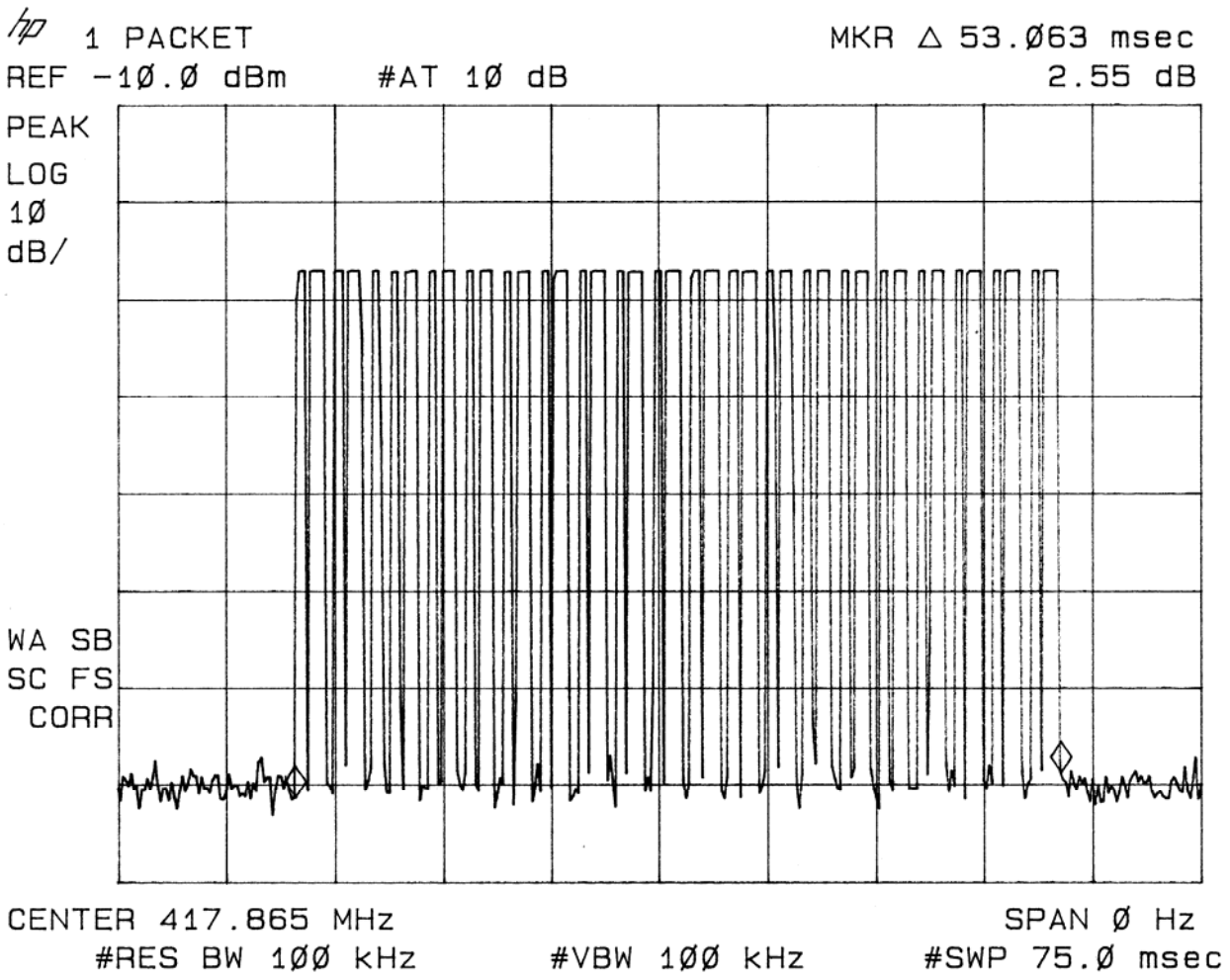
85ms * 0.667 = 56.695ms total on time
20log (56.695ms/100ms.) = -4.929 dB correction factor.

As provided in Part 15.35 of the FCC rules, a correction factor of –4.9 dB is used for the calculations on the data sheet.

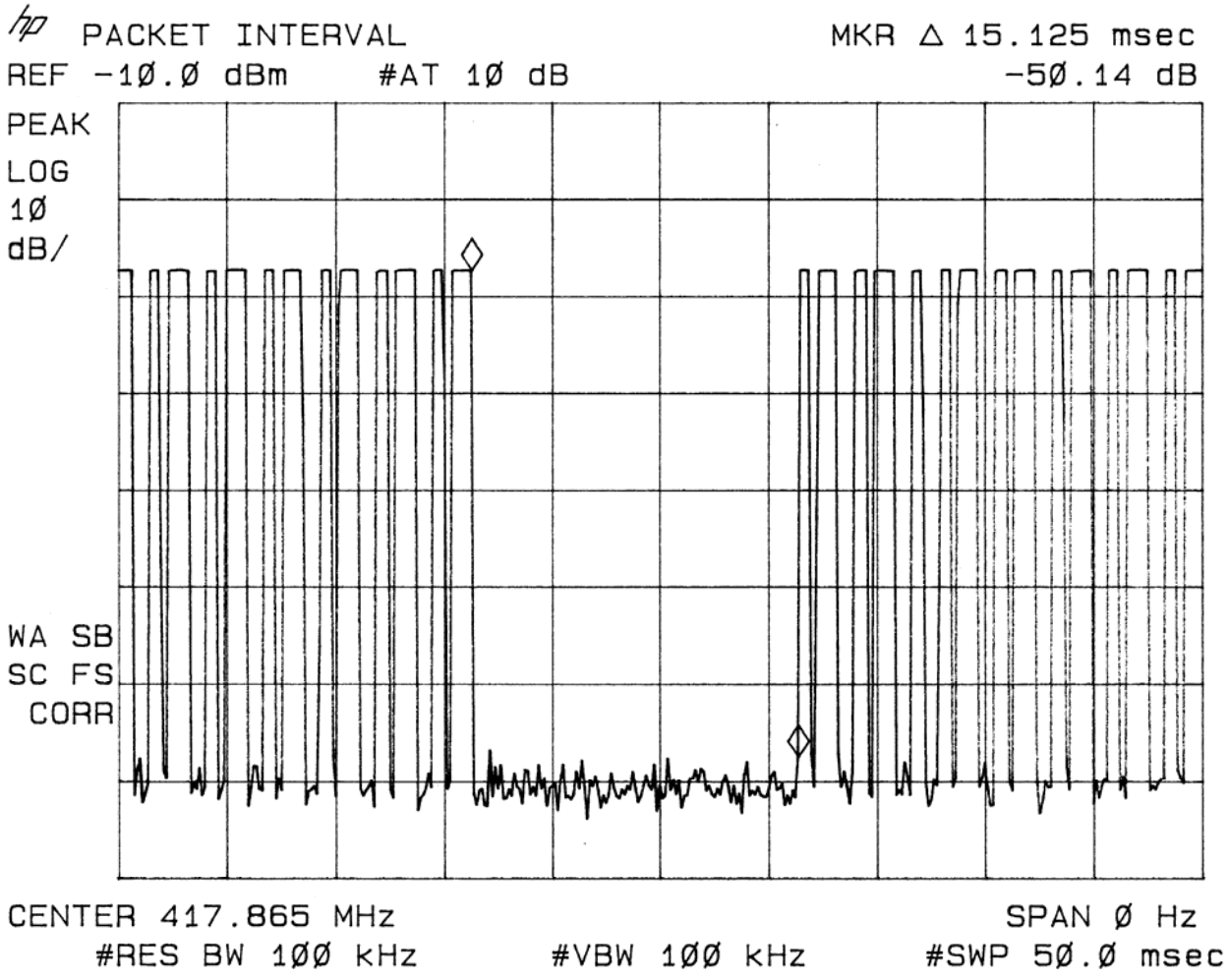
Plot 2



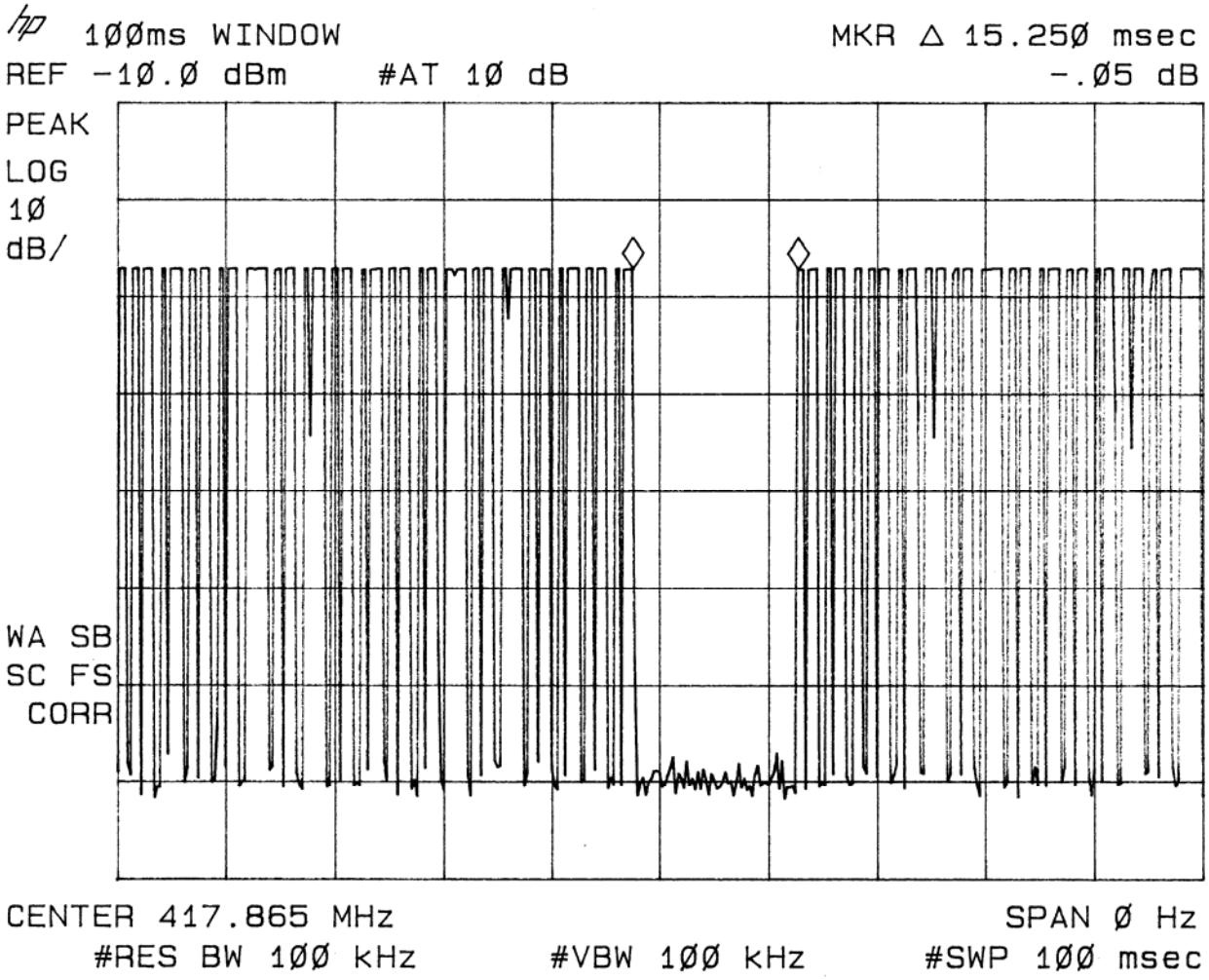
Plot 3


1 PACKET
MKR Δ 53.Ø63 msec
REF −1Ø.Ø dBm
#AT 1Ø dB
2.55 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 417.865 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 75.Ø msec

Plot 4


PACKET INTERVAL
MKR Δ 15.125 msec
REF −1Ø.Ø dBm
#AT 1Ø dB
−5Ø.14 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 417.865 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 5Ø.Ø msec

Plot 5



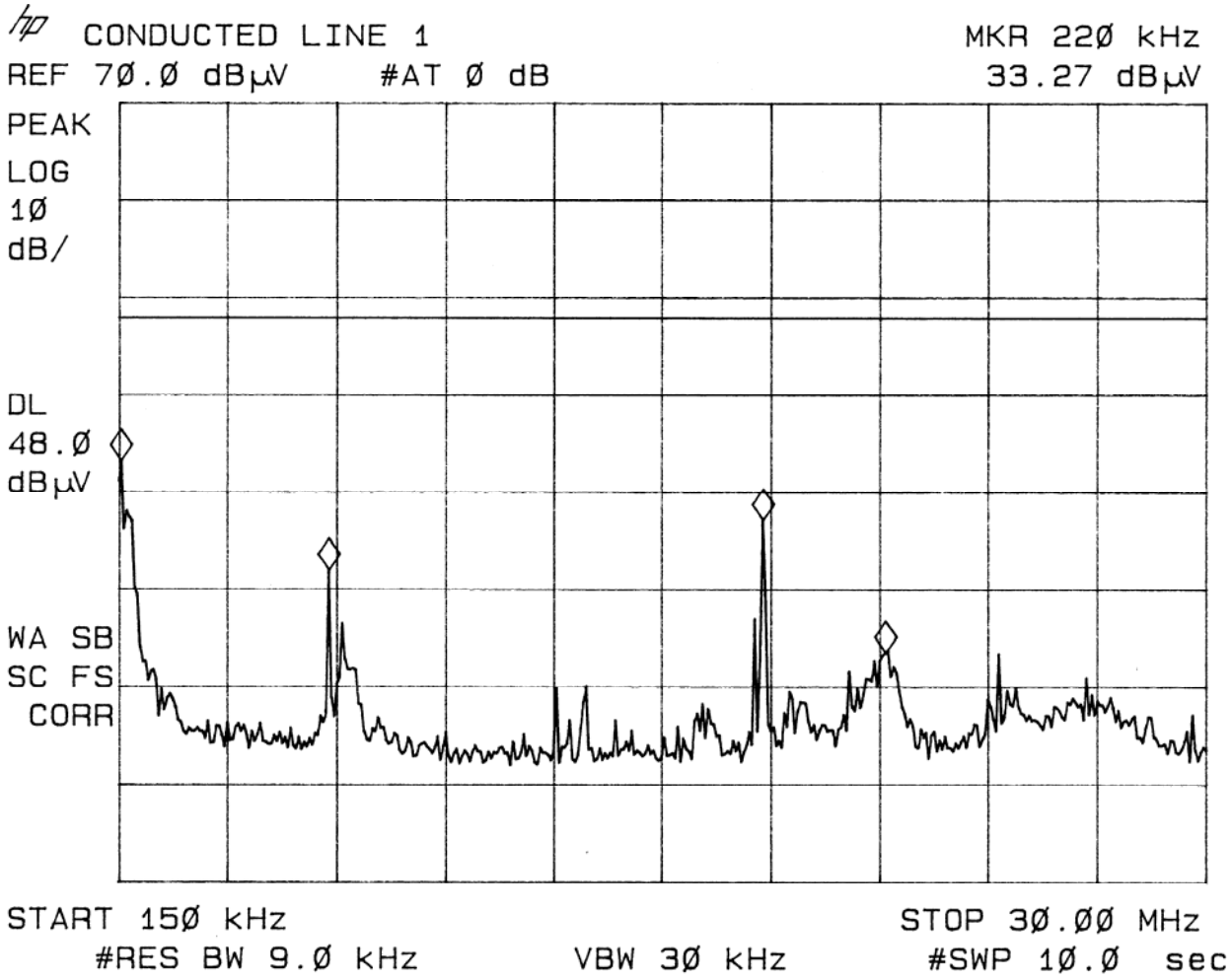
D. RECEIVER RADIATED EMISSIONS

The receiver circuit is a single conversion superhetrodyne using a SAW stabilized local oscillator at 407.30 MHz. The device was locked in the receive mode and scanned from 30 MHz to 5 GHz. The LO and its second harmonic were detected but both were more than 20 dB under the limit specified in 15.109 (a). No other emissions were detected.

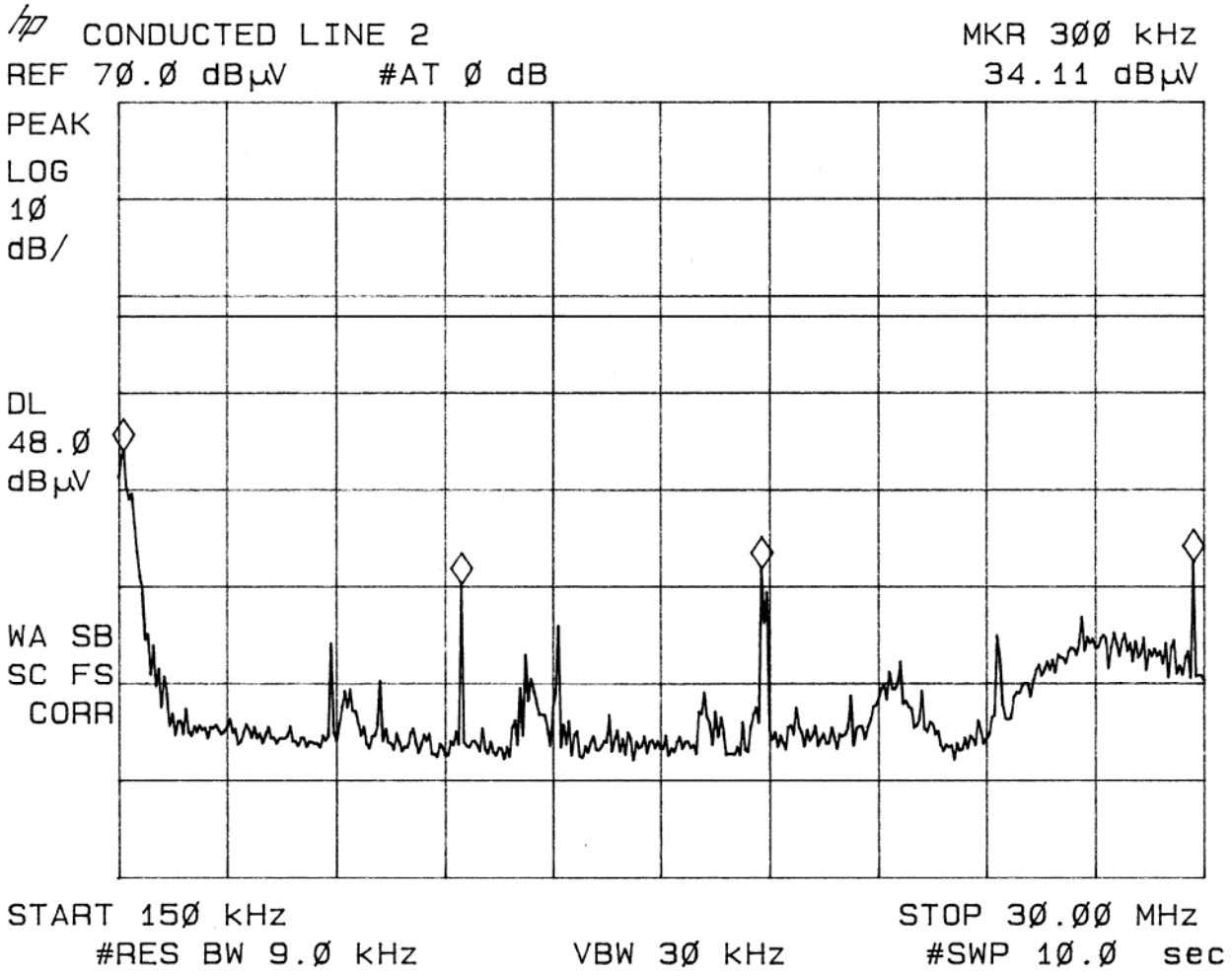
E. MEASUREMENT PROCEDURE: LINE CONDUCTED EMISSIONS

Plots of the conducted emissions were taken using a Compliance Design, 50µH LISN fed from the mains. The output was connected to an HP8594E spectrum analyzer with the display line set to 48 dBµV. The scans were then plotted with an HP7475A pen plotter.

Plot 6



Plot 7


CONDUCTED LINE 2
MKR 3ØØ kHz
REF 7Ø.Ø dBµV
#AT Ø dB
34.11 dBµV
PEAK
LOG
1Ø
dB/
DL
48.Ø
dBµV
WA SB
SC FS
CORR
START 15Ø kHz
STOP 3Ø.ØØ MHz
#RES BW 9.Ø kHz
VBW 3Ø kHz
#SWP 1Ø.Ø sec