Test Report

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

DUT:	Pool Alarm Transmitter
FCC ID	EIL-POOLGUARD-PBM
Model	Poolguard
Date:	7-Feb-2003

Manufacturer:
PBM Industries, Inc.
922 Roger Lane
North Vernon, IN 47265
(812) 346-2648

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A. DEVICE UNDER TEST

The product is a transmitter used as the sensing device for a swimming pool alarm system. This product is designed to operate under the provisions of Part 15.231 of the FCC rules.

The frequency of operation is 418.00 MHz. nominal. The modulation mode is on/off keying using a proprietary Manchester phase format. In normal operation, this device is programmed to transmit alarm packets for as long as the alarm condition exists.

The test sample was supplied in the final production plastic enclosure. The device is composed of two assemblies: 1) a white plastic outer shell which serves as the housing and mounting frame and 2) a removable inner tray which contains the circuit board and the electronic components. The device is powered by an internal 9 volt alkaline battery. The rf circuitry is contained on a separate daughterboard that is attached to the main circuit board.

The transmitter circuit is built around a modified colpitts oscillator using a SAW resonator as the frequency determining element. The output/matching stage is a three element lowpass filter. The radiating element is a wire antenna, ¼ wave long, soldered directly to the circuit board. There is no provision to connect an external antenna.

B. MEASUREMENT PROCEDURE: RADIATED EMISSIONS

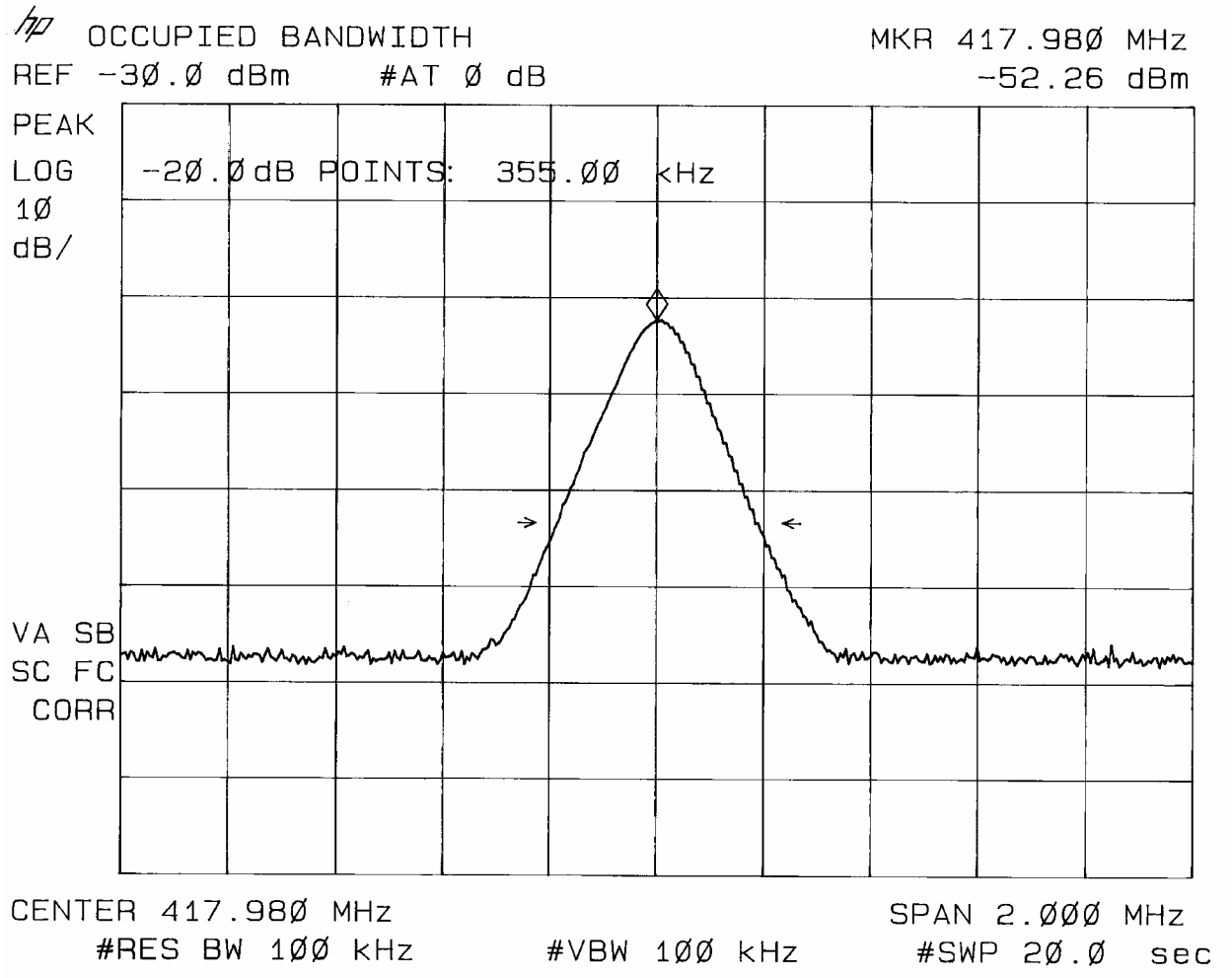
Radiated emissions testing of this device was conducted at the Carl T. Jones test facility located in Springfield, Virginia. FCC Site #90490

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 both positions as shown in the test setup photographs

It was found that when the device was tested in the white plastic housing (shown in the first test setup photo) the additional elevation above the table surface resulted in significantly lower readings than when the tray was removed from the housing and placed directly on the turntable. The test was redone using the lower position.

For the purpose of radiated emissions testing, the test sample was specially programmed to continuously transmit the alarm signal. The occupied bandwidth plot below (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.

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

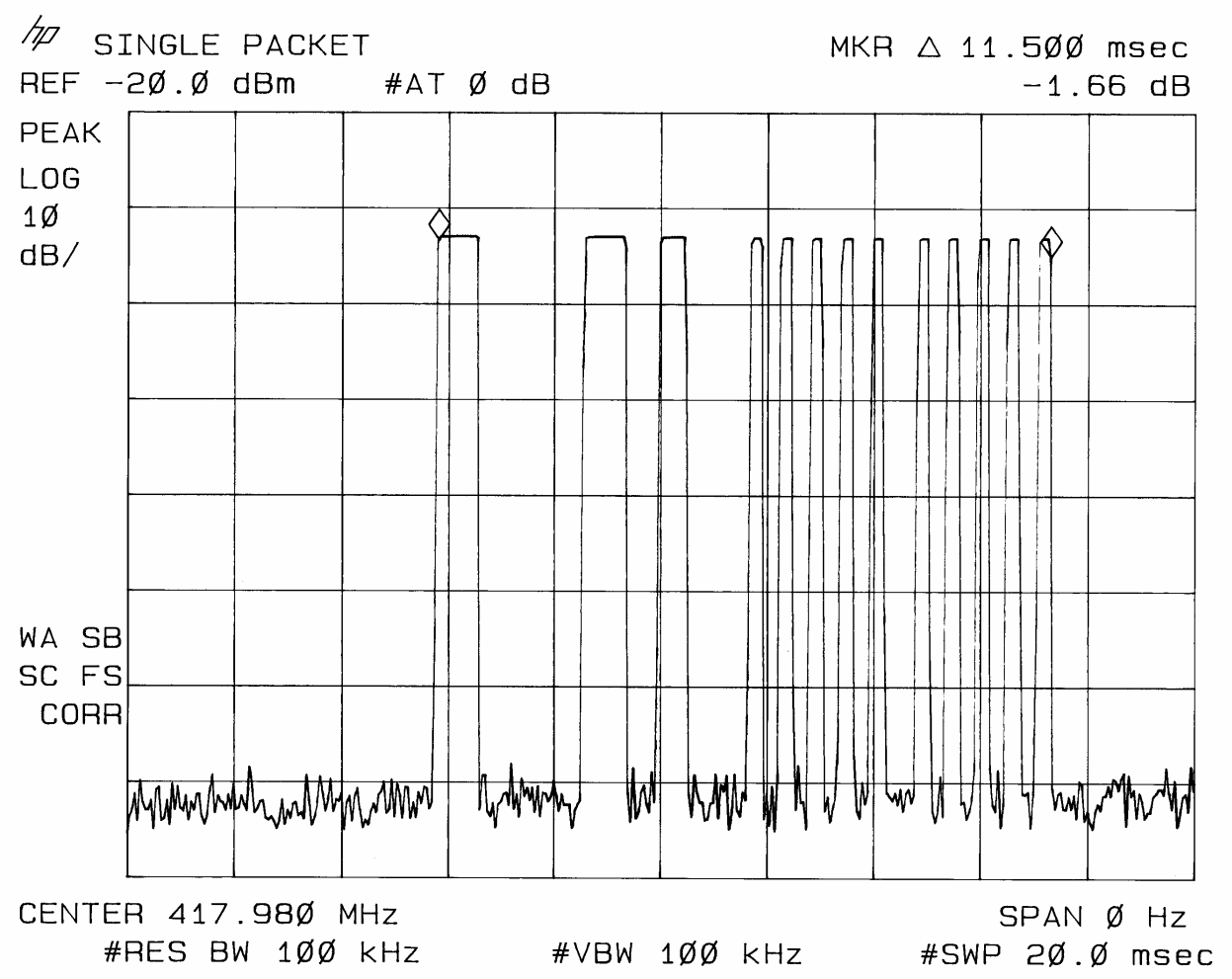
CLIENT: PBM Industries FCC ID:
ANTENNA: DIPOLES/DRG HORN EUT: ALARM TRANSMITTER
PART 15.231 DATE: 07-FEB-03

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
418.011	H	22.7	-29.94	20.0	97275	9727	10333
836.022	V	30.2	-75.81	20.0	1174	117	1033
1254.033	H	27.6	-82.52	20.0	402	40	1033
1672.044	V	29.3	-68.77	20.0	2380	238	500
2090.055	V	31.0	-89.91	20.0	254	25	1033
2508.066	V	32.2	-90.15	20.0	283	28	1033
2926.077	H	33.6	-94.12	20.0	211	21	1033
3344.088	V	34.9	-81.16	20.0	1089	109	1033
3762.098	V	36.1	-92.35	20.0	345	34	500
4180.108	V	37.4	-103.47	20.0	111	11	500

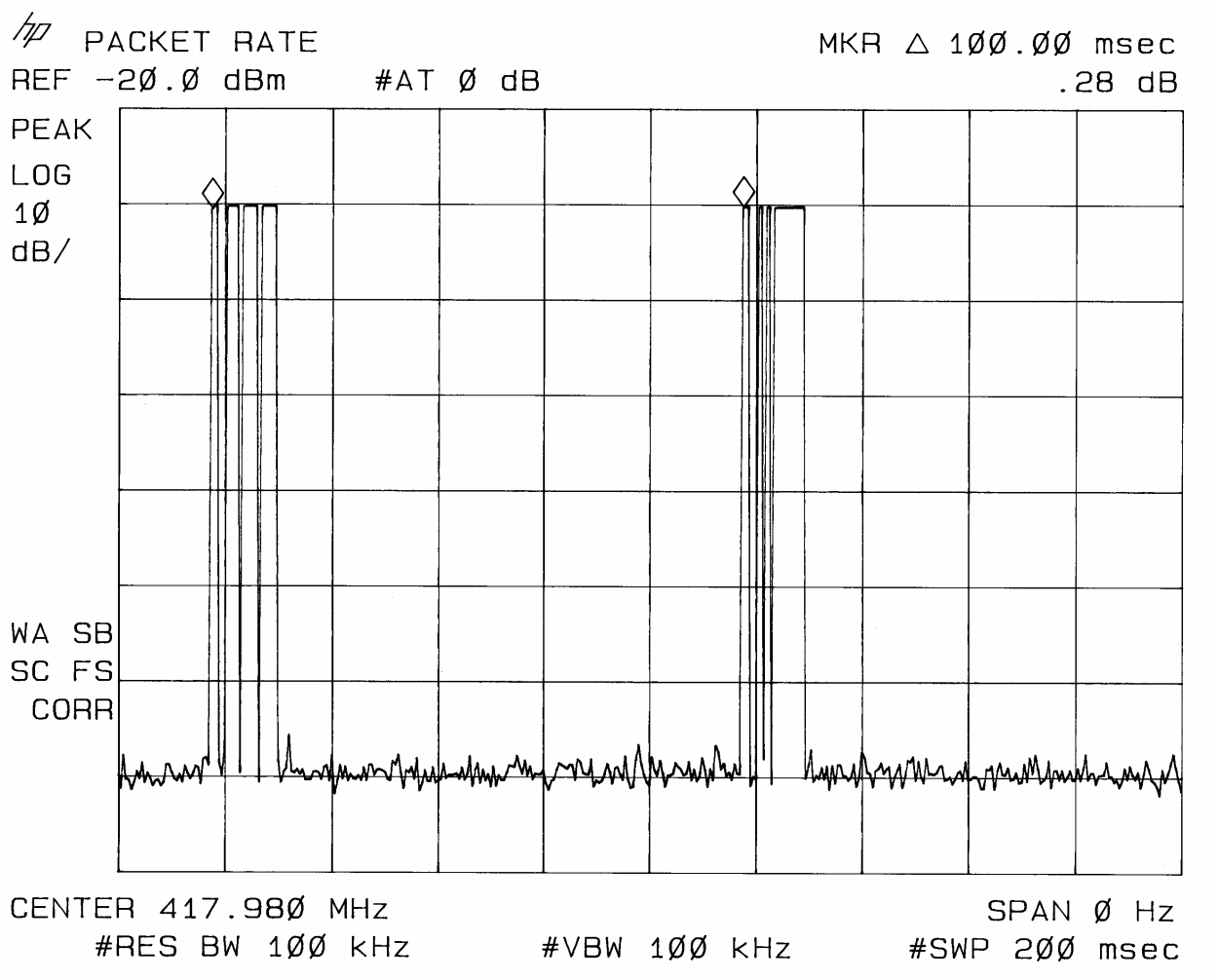
C. DUTY CYCLE AND INTERVAL CALCULATIONS

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 for column five in Table 1 is derived from the manufacture's description of the data scheme and is verified by plots 2 and 3.

Plot 2



Plot 3



The code format for this device is a 50% Manchester phase pulse position scheme with a total packet length of 11.5ms. (6.75ms. Manchester phase). The packets are repeated every 100ms resulting in the following duty cycle correction factor.

20log(6.755ms.(total on time)/100ms.) = -23.413 dB.

As provided in Part 15.35 of the FCC rules, a correction factor of –20.0 dB is used for the calculations on the data sheet.