Test Report

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

DUT:	Keyfob Transmitter
FCC ID	Q6R-HHTX-ASW-433
Section	15.231
Date:	26-June-2003

Manufacturer:	RF Laboratories, Inc. 1412 Center Avenue Oostburg, WI 53070 (920) 564-2700
Prepared by:	Control Design & Testing, Inc. 6010 Red Fox Drive Spotsylvania, VA 22553 (540) 582-2826

A. DEVICE UNDER TEST

The product is a small keychain style transmitter used for general purpose remote control applications. The product is designed to operate under the provisions of Part 15.231 of the FCC rules in the United States and RSS-210 in Canada.

The device is self contained in a plastic enclosure and is powered by an internal 12 volt alkaline batteryl. The circuitry is configured on a single circuit board with the radiating element etched as a loop on the board. There is no means to connect an external antenna.

The frequency of operation is 433.92 MHz., nominal. The modulation mode is on/off keying using a 50% duty cycle, Manchester phase pulse position scheme. The packets consist of a start pulse (1.24ms.) followed by ten bit pulses (400µs. each).

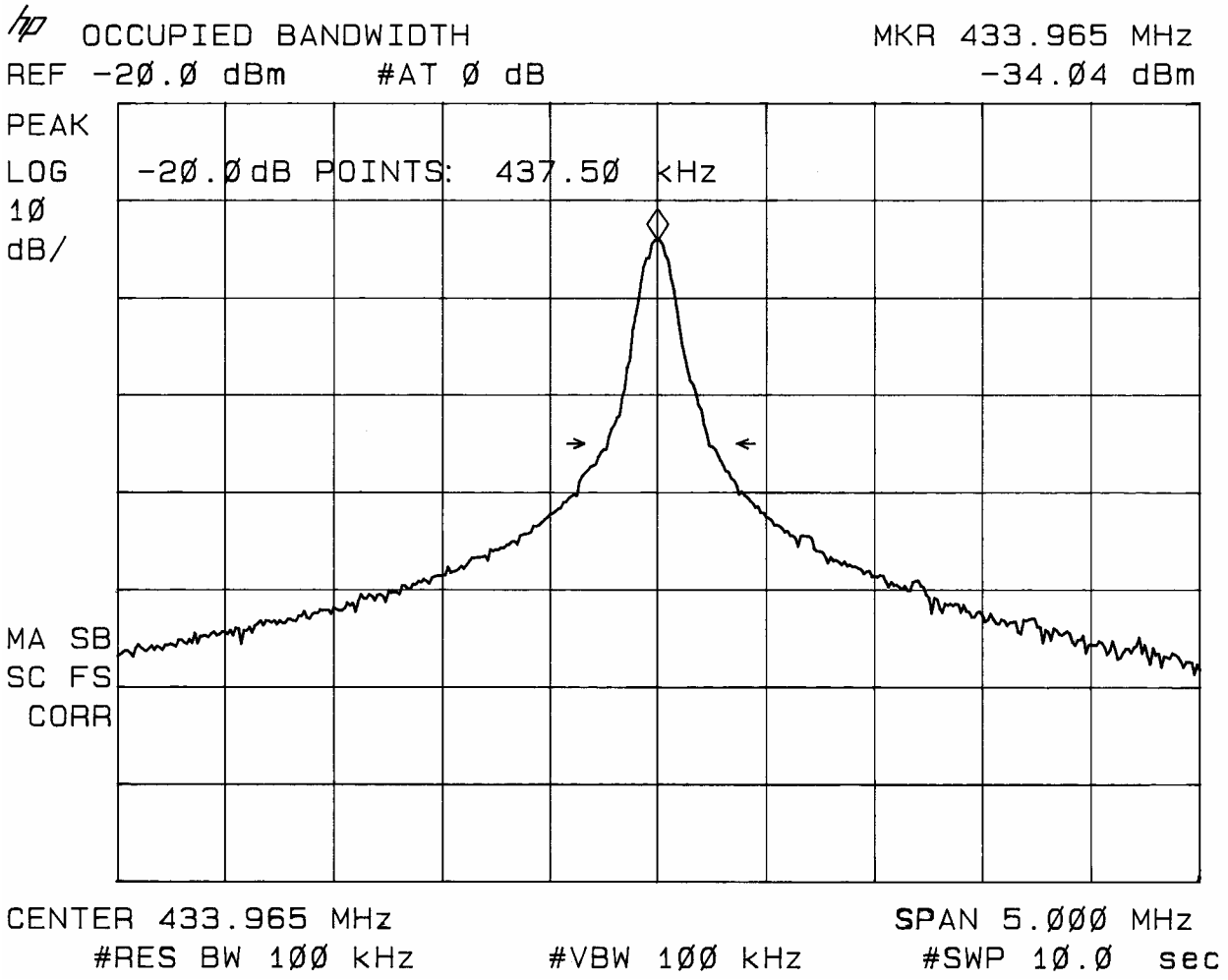
B. MEASUREMENT PROCEDURE: RADIATED EMISSIONS

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 tested in three positions as shown in the setup photographs.

In normal operation, this device transmits upon activation of either of the push buttons and ceases transmission immediately when the button is released. For the purpose of radiated emissions testing, the test sample was specially programmed to transmit a continuous stream of packets as soon as the battery was installed. The occupied bandwidth plot below (Plot 1) was captured using this signal.

Plot 1


OCCUPIED BANDWIDTH
MKR 433.965 MHz
REF -2Ø.Ø dBm
#AT Ø dB
-34.Ø4 dBm
PEAK
LOG
1Ø
dB/
-2Ø.Ø dB POINTS: 437.5Ø kHz
MA SB
SC FS
CORR
CENTER 433.965 MHz
SPAN 5.ØØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1Ø.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 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 the table below.

Table 1

RADIATED EMISSIONS DATA

CLIENT: RF LABORATORIES FCC ID: Q6R-HHTX-ASW-433
ANTENNA: DIPOLES/DRG HORN EUT: KEYFOB TRANSMITTER
PART 15.231 DATE: 26-JUNE-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
433.964	H	23	-41.78	20.0	25763	2576	10997
867.928	H	30.2	-74.71	20.0	1332	133	1099
1301.892	V	27.6	-66.36	20.0	2582	258	500
1735.856	H	29.7	-60.73	20.0	6288	629	1099
2169.820	V	31.6	-67.01	20.0	3798	380	1099
2603.784	V	33.1	-78.24	20.0	1239	124	1099
3037.748	V	34.0	-77.16	20.0	1556	156	1099
3471.712	V	35.1	-81.99	20.0	1013	101	1099
3905.676	H	36.4	-84.13	20.0	919	92	1099
4339.640	H	37.8	-88.30	20.0	668	67	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 listed in column five, Table 1 is derived from the manufacturer's description of the data scheme and is verified by plots 2 and 3.

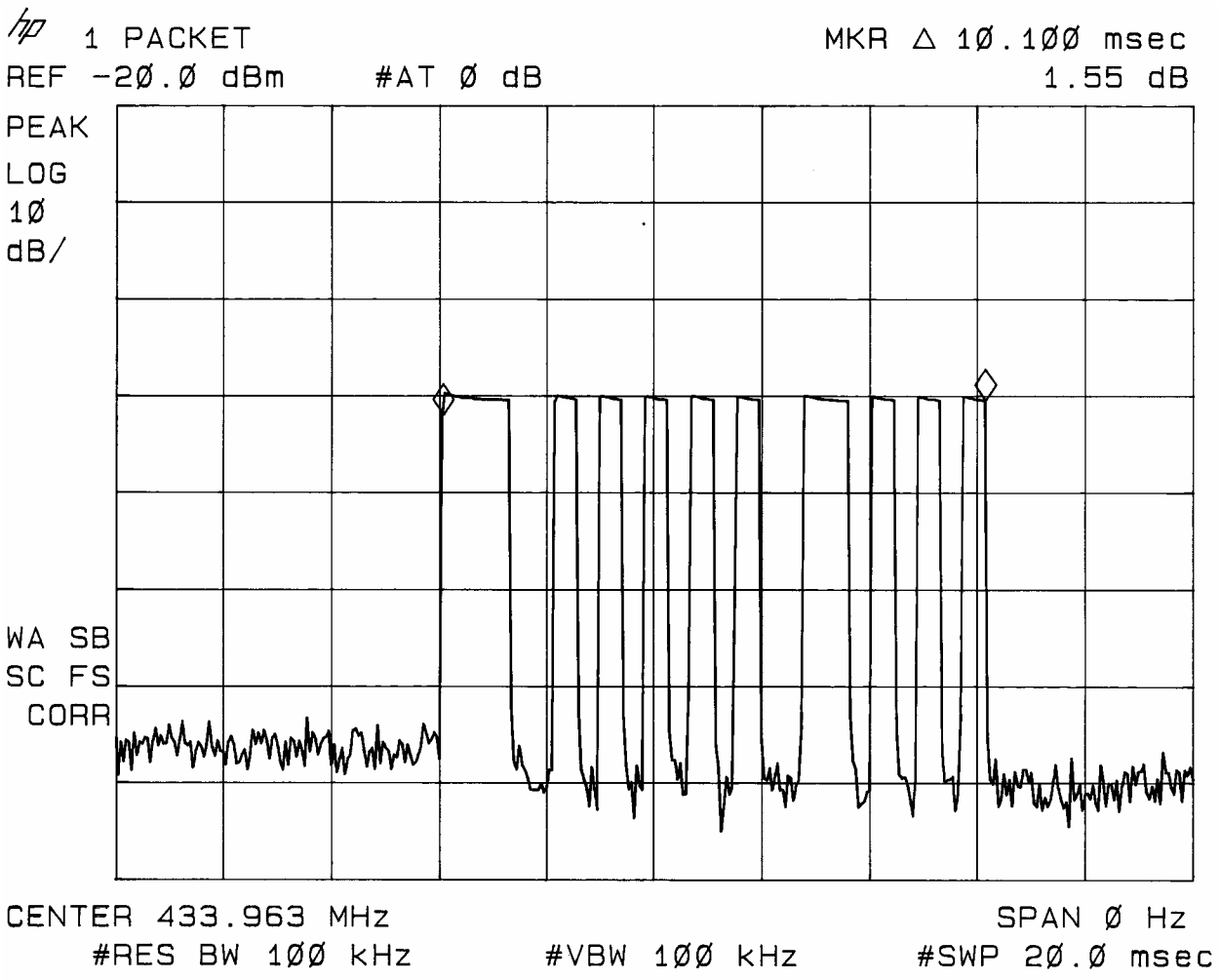
The data packet consists of one 1.24ms. start bit followed by ten 400µs. address bits. The packets are spaced at 100ms. intervals so that only one packet can occur in any 100 ms. period. The correction factor is given by:

start bit	1.240ms.
address bits (400µs X 10	4.000ms.
total on time	5.240ms.

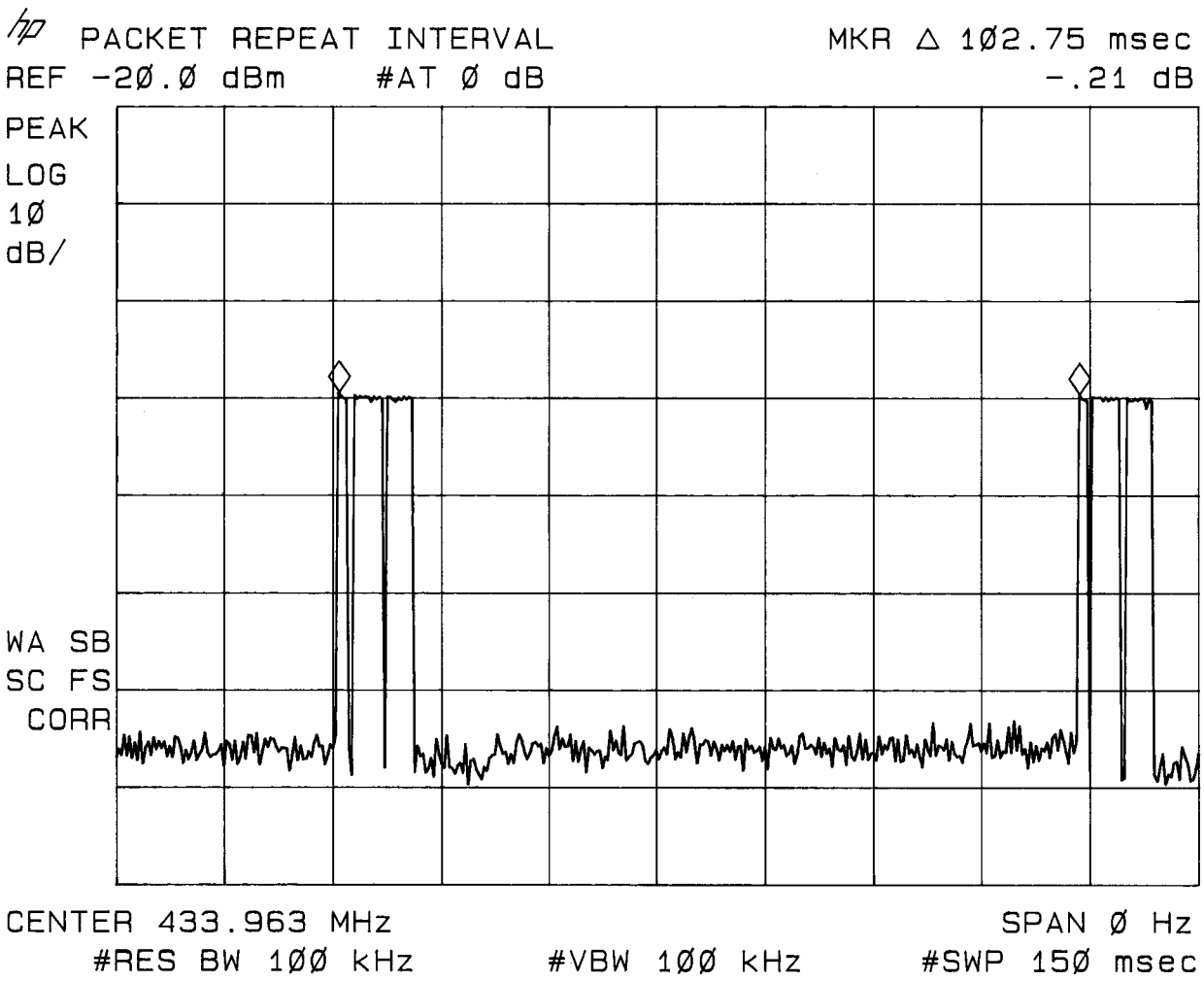
20log(5.240ms./100ms.) = -25.8 dB.

As provided in Part 15.35 of the FCC rules, a correction factor of –20 dB is used for the calculations on the data sheet.

Plot 2


1 PACKET
MKR Δ 1Ø.1ØØ msec
REF -2Ø.Ø dBm
#AT Ø dB
1.55 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 433.963 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 2Ø.Ø msec

Plot 3


PACKET REPEAT INTERVAL
MKR Δ 1Ø2.75 msec
REF -2Ø.Ø dBm
#AT Ø dB
-.21 dB
PEAK
LOG
1Ø
dB/
WA SB
SC FS
CORR
CENTER 433.963 MHz
SPAN Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 15Ø msec