

Test Report

DUT: Wireless temperature sensor model ES100-A-TS
Test Date: 18-July-2001

Manufacturer: Excel Energy Technologies, Ltd.
624 S. Boston, Suite 300
Tulsa, OK 74119
(918) 585-5000

Conducted by: Control Design & Testing, Inc.
6010 Red Fox Drive
Spotsylvania, VA 22553
(540) 582-2826

CD&T

FCC ID: PLS-ES100-A-TS

A. DEVICE UNDER TEST

The product is a transmitter used to sense and relay temperature data as part of an energy management system. This device works in conjunction with a transceiver (PLS-ES500-A-RFT). The product is designed to operate under the provisions of Part 15.249 of the FCC rules.

The transmit frequency is 916.500 MHz. nominal. The modulation mode is on/off keying using a pulse width scheme. This device is programmed to transmit data packets at intervals of 1 to 5 minutes. Power for the device is provided by an internal "AA" size 3.6 volt lithium battery.

The rf section consists of an RF Monolithics TX6000 transmitter module, a two element antenna matching network and PCB trace antenna. There is no provision to connect an external antenna.

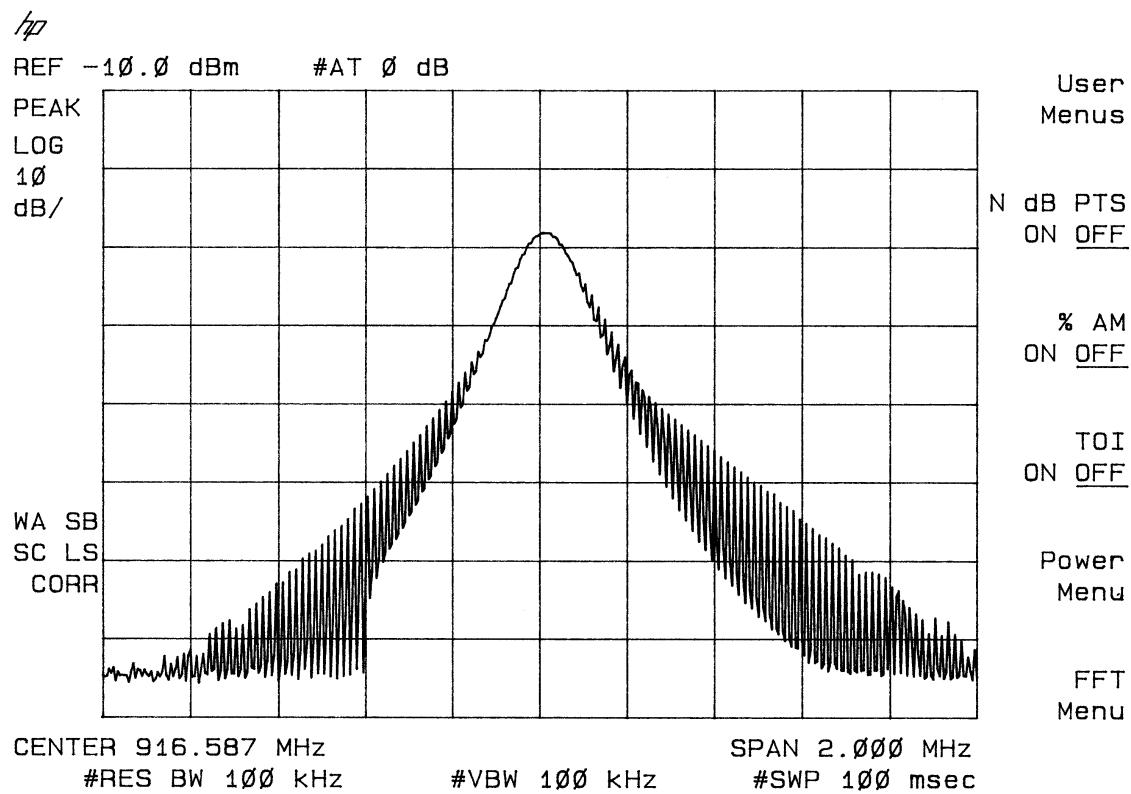
B. MEASUREMENT PROCEDURE: RADIATED EMISSIONS

Testing of this device was conducted at the Hyak Laboratory test facility located in Spotsylvania, Virginia.

Transmitter field strength measurements were conducted according to the procedures set forth in ANSI C63.4 (1992). Testing was conducted with a fresh battery and monitored periodically to insure that the battery voltage (under load) was maintained at 95% of nominal or greater.

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 major planes as shown in the test setup photographs.

For the purpose of testing, the sample was set to transmit a constant 1 kHz. pulse stream. However, the occupied bandwidth (Plot 1) was captured with the sample device transmitting typical data packets.

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 10 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 all three of the setup 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 8th harmonic.

C. DUTY CYCLE AND INTERVAL CALCULATIONS

The occupied bandwidth measurement was made using an HP8596E spectrum analyzer and plotted with an HP7475A pen plotter. The duty cycle correction factor for this device is approximately -6dB, but since the peak readings for all detected harmonics were below the limits, the duty cycle correction factor was not applied to the calculations.

Table 1

RADIATED EMISSIONS DATA							
CLIENT: Excel Energy Tech.	FCC ID: PLS-ES100-A-TS			ANTENNA: DIPOLES/DRG HORN	EUT: DATA TRANSMITTER		
PART 15.249, 15.35			TEST DATE: 18-JULY-01				
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
916.590	V	30.5	-43.91	0.0	47808	47808	50000
1833.180	V	30.2	-90.34	0.0	220	220	500
2749.770	V	33.4	-94.27	0.0	203	203	500
3666.360	H	35.7	-97.80	0.0	176	176	500
4582.950	V	36.6	-100.52	0.0	143	143	500
5499.539	H	38.6	-108.03	0.0	76	76	500
6416.129	H	39.1	-111.68	0.0	53	53	500
7332.719	V	40.8	-114.62	0.0	46	46	500