FCC: TCB Review

Attention: Reviewing Engineering

Reference:	Standard:	FCC 15.247
	Applicant:	Recon Dynamics
	Equipment:	Remote Control
	Model #:	Personal tracker - Generic Sensor Alarm with LBS
	ID #:	YQN-PT10A

Dear Sir/Madam:

The below alternative method was used to determine the output power of the transmitter. This method was selected based on the transmitter bandwidth and the limitations on the measurement equipment.

Sincerely,

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Measurement of Digital Transmission Systems

Operating under Section 15.247
March 23, 2005

Section 15.403(f) – Digital Modulation
Digital modulation is required for Digital Transmission Systems (DTS). Digital modulation: The process by which the characteristics of a carrier wave are varied among a set of predetermined discrete values in accordance with a digital modulating function as specified in document ANSI C63.17-1998.

Section 15.247(b) – Power output.
This is an RF conducted test. Use a direct connection between the antenna port of the transmitter and the spectrum analyzer, through suitable attenuation. Power Output Option 1 is a peak measurement. Power Output Option 2 is the same procedure used for UNII output power measurements. Either option can be used for DTS devices.

Power Output Option 2
Power output measurement allowed per Section 15.247(b) (3).
In the following, "T" is the transmission pulse duration over which the transmitter is on and transmitting at its maximum power control level. Measurements are performed with a spectrum analyzer. Three methods are provided to accommodate measurement limitations of the spectrum analyzer depending on signal parameters.
Set resolution - 2 - bandwidth (RBW) = 1 MHz.
Set span to encompass the entire emission bandwidth (EBW) of the signal. Use automatic setting for analyzer sweep time (except in Method #2). Check the sweep time to determine which procedure to use.

- If sweep time ≤ T, use Method #1 -- spectral trace averaging -- and sum the power across the band. Note that the hardware operation may be modified to extend the transmission time to achieve this condition for test purposes. (Method #1 may be used only if it results in averaging over intervals during which the transmitter is operating at its maximum power control level; intervals during which the transmitter is off or is transmitting at a reduced power level must not be included in the average.)
- If sweep time > T, then the choice of measurement procedure will depend on the EBW of the signal.
  - If EBW ≤ largest available RBW on the analyzer, use Method #2 -- zero-span mode with trace averaging -- and find the temporal peak. (Method #2 may be used only if it results in averaging over intervals during which the transmitter is operating at its maximum power control level; intervals during which the transmitter is off or is transmitting at a reduced power level must not be included in the average.)
  - If EBW > largest available RBW, use Method #3--video averaging with max hold and sum power across the band.

Method #1
1. Set span to encompass the entire emission bandwidth (EBW) of the signal.
2. Set RBW = 1 MHz.
3. Set VBW ≥ 3 MHz.

4. Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode.
5. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run".
6. Trace average 100 traces in power averaging mode.
7. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement - 3 - function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

Section 15.247(d) – Power spectral density (PSD).
The same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used. Use PSD Option 1 if Power output Option 1 was used. Use PSD Option 2 if power output Option 2 was used.

PSD Option 2
Locate and zoom in on emission peak(s) within the passband.

- Set RBW = 3 kHz.
- Set VBW > 9 kHz.
- Set Sweep time to Automatic
- Use a peak detector. A sample detector mode can be used only if the following can be achieved with automatic sweep time and adjusting the bin width.

1. Bin width (i.e., span/number of points in spectrum display) < 0.5 RBW.
2. The transmission pulse or sequence of pulses remains at maximum transmit power throughout each of the 100 sweeps of averaging and that the interval between pulses is not included in any of the sweeps (e.g., 100 sweeps should occur during one transmission, or each sweep gated to occur during a transmission).

Note: If condition 2 cannot be achieved, then PSD Option 1 (peak detector on max hold) must be used and trace averaging cannot be used.

- Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run". - 6 -
- Trace average 100 traces in power averaging mode. Do not use video averaging mode.

Note: Some analyzers will automatically select sample mode when trace averaging is selected. If a peak detector is used, then peak detector must be manually selected when trace averaging is enabled.