

FA-250M Transmitter Certification Testing – Additional Notes

Duty Cycle: The duty cycle is calculated over a 100 mSec averaging window as specified in the rules. The message packet contains a total of 213 pulses each 20 uSec in duration, for a total transmitter on time of 4.26 mSec with represents a worst-case duty cycle of 4.26%. The duty cycle correction used is the maximum of 10%.

MPE: Calculation for compliance with MPE requirements (Section 2.1091) using a worst case of 0.25 Watt, unity antenna gain, and the $f/300$ (mW/cm^2) limit for general applications. This device is used in fixed locations and is not carried or worn by the end user. The key factor is duty cycle. Under normal conditions, a 12-packet message is sent a maximum of once every 15 minutes. Worst case, a 12-packet message is sent, once per minute, or 72 packets in a 6-minute period.

$$\begin{aligned} \text{Total On time per packet} &= 4.26 \text{ mSec (for maximum packet length)} \\ \text{Duty Cycle} &= (4.26 \times 72) \text{ mSec} / (6 \times 60 \times 1000) \text{ mSec} = 0.0852\% \\ \text{EIRP} &= (0.25\text{W})(0.000852) = 213 \text{ microwatt. Using a distance of 20 cm:} \\ &213 \text{ microwatt} / (4 \pi 20^2) = 42.38 \text{ nW}/\text{cm}^2 \end{aligned}$$

Dwell Time: The Dwell Time is the length of one packet. The worst-case dwell time for an extended length packet is 40.1 mSec. The standard packet is about 30 mSec duration. A worst-case transmission rate, corresponding to a repeated change of state transmissions would result in a maximum of 12 packets in any 10-second period with each packet on a different frequency. The maximum dwell time is thus the dwell time of an extended packet or 40.1 ms.

Modular Approval: Public Notice DA 00-1407 contains guidelines and requirements for obtaining modular transmitter approval:

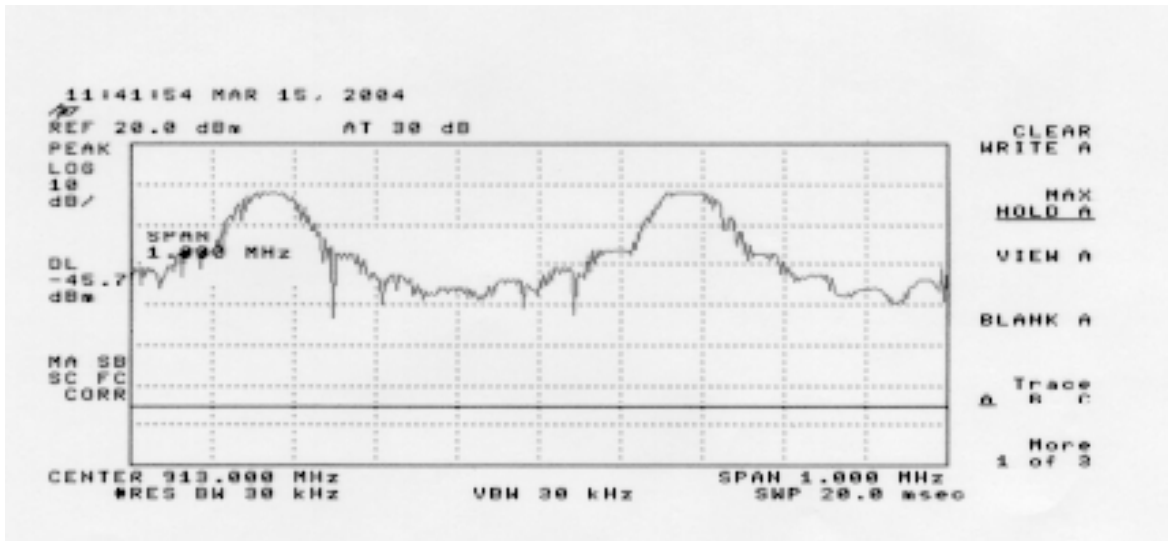
- A. The FA-250M transmitter module is a self-contained device, powered by an internal single cell, 2/3 A size LiMnO₂ primary cell (nominally 3 Volts). An internal voltage regulator provides a stable power supply to the VCO and PA driver stages.
- B. The module has its own reference oscillator, permanently attached internal antenna per 15.204, and RF shielding over the transmitter portion of the module.
- C. An external switch or data input activates the module, to signal a change of state. This input is buffered by the internal microcontroller.
- D. The module complies with all applicable FCC rules including 15.247.
- E. The module was tested as a stand-alone device.

Measurements performed at Inovonics Wireless Corp. lab

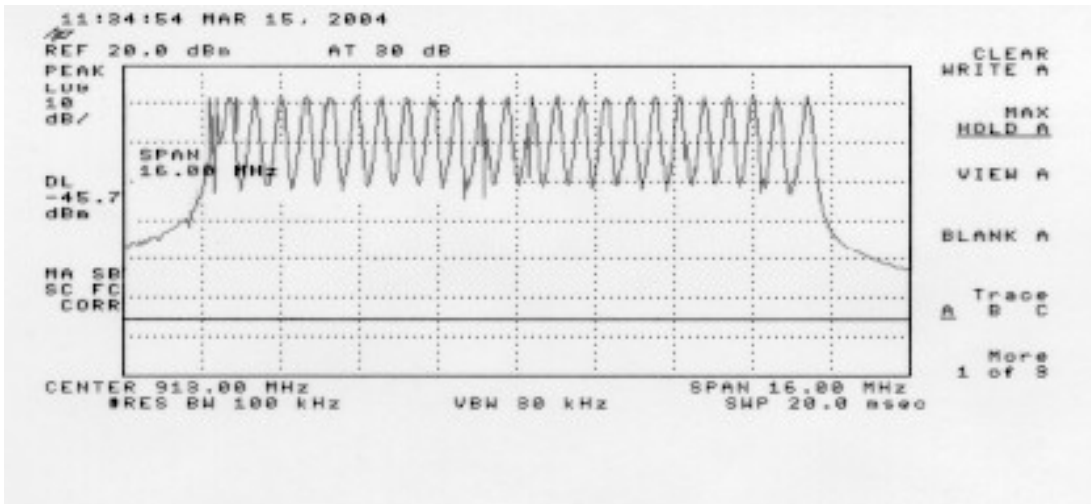
Equipment used: HP-8594E Spectrum Analyzer

Conducted Power Output: The antenna was removed and a coax was temporarily connected to allow for direct measurement of power using the spectrum analyzer. The power output was measured at +21 dBm was measured into 50 ohms.

Spectrum Plots: The following two spectrum plots were made using a test antenna closely coupled to the test unit.



Spectrum Plot 1 shows two adjacent channels with modulation. Compliance with section 15.247(a)(1) is demonstrated with a test sample configured with firmware allowing two adjacent channels to be captured. Plot 1 also shows the 20 dB bandwidth of a single channel of 300 kHz, to demonstrate compliance with 15.247(a)(1)(i).



Plot 2 demonstrates compliance with 15.247(a)(1)(i) — Number of hopping channels. This is a stored display of many sequential transmissions to show the overall band occupied by the transmitter.