

Antennas used in Tapco Model Radio 136377 902-928MHz 1Watt FHSS transmitter/receiver  
Report by:  
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Date: October, 5 2017

Tapco Model: Radio 136377  
FCC ID: 2ANWN-02ANWN

All antennas were used in RF testing by:

Element Materials Technology  
Element Minneapolis - Brooklyn Park  
9349 W Broadway Ave.  
Brooklyn Park, MN 55445 USA

Element Project Report #MARJ00007  
Element Project: TS-MARJ-0001

Radio Manufacture  
Traffic and Parking Control Co., Inc. – Tapco  
5100 W Brown Deer Road,  
Brown Deer, WI 53223

Transmitter Details  
1Watt FHSS Transceiver.  
4 approved antennas  
5 approved data rates

Four different antennas were evaluated for use on the Radio 136377 Transceiver.

- 1) 6dBi Omni - Fiberglass
  - a. Manufacturer Hanna Wireless
  - b. Model HW-OD9-5-NF
  - c. 50Ω, 824-960MHz
  - d. N-type to RPSMA will be used for unique antenna connector requirements.
  - e. The N-type to RPSMA adapter will have to be permanently attached by epoxy or Loctite or similar, in order to meet the 15.203 requirement.
- 2) 3dBi Omni Whip antenna - RPSMA
  - a. Manufacturer Pulse Electronics
  - b. Model W1063
  - c. One-eighth wavelength dipole
  - d. 3dBi 50Ω, 868 – 928MHz
- 3) 3dBi Omni Low Profile 'Puck' shaped Antenna
  - a. Manufacturer Antenna Plus LLC
  - b. Model AP-90-S2-RP
  - c. Model used in testing was AP-90-S2-RP
    - i. 18inch coax with Reverse SMA connector.
  - d. 3dBi 50Ω, 890 – 950MHz
- 4) 10.64dBi Yagi
  - a. Manufacturer Laird PLC

- b. Model PC906N
- c. 50Ω, 896 – 940MHz 8dBd calculated to 10.64dBi
- d. N-type to RPSMA will be used for unique antenna connector requirements.
- e. The N-type to RPSMA adapter will have to be permanently attached by epoxy or Loctite or similar, in order to meet the 15.203 requirement.

#### 6dBi Omni, 3dBi Whip, 3dBi Puck Limitations

- 1) 1Watt output Limitations using 8dB – 39.73%/100ms Duty Cycle Correction using 50 Hop Channels or more.
  - a. 15kbaud 2GFSK Data rate
  - b. 120kbaud 2GFSK Data Rate
  - c. 234kbaud 2GFSK Data Rate
- 2) 1/4Watt output no duty cycle limitations – 25 Hop Channels or more
  - a. 420kbaud – 4GFSK Data Rate – 210k symbol rate
  - b. 620kbaud – 4GFSK Data Rate – 310k symbol rate

#### Yagi Limitations include

For 50 Hop Channel systems a 4.64dB lower conducted transmitter output power is required to maintain a combined conducted + antenna gain output < 36dBm. This will require a 25.36dBm – 343mW Maximum transmitter conducted output power. The duty cycle correction factor will be required in addition to this output limitation.

For 25channels systems the maximum combined conducted power + antenna gain must be less than 30dBm combined conducted + antenna gain. The 10.64dBi antenna requires lowering the conducted output of the transmitter to < 19.35dBm – 86.3mW Maximum transmitter conducted output power.

- 1) 25.36dBm – 343mW Maximum transmitter conducted output power using 8dB – 39.73%/100ms Duty Cycle Correction using 50 Hop Channels or more.
  - a. 15kbaud 2GFSK Data rate
  - b. 120kbaud 2GFSK Data Rate
  - c. 234kbaud 2GFSK Data Rate
- 2) 19.35dBm – 86.3mW Maximum transmitter conducted output power - no duty cycle correction required.
  - a. 420kbaud – 4GFSK Data Rate – 210k symbol rate
  - b. 620kbaud – 4GFSK Data Rate – 310k symbol rate