Antennas used in Tapco Model Radio 136377 902-928MHz 1Watt FHSS transmitter/receiver

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Original Certification Date: October, 5 2017
Class II Permissive Change Update: November 23, 2022 (version 2)

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

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

Class II Permissive Change Update October 10, 2022 testing by:
F2 Labs Headquarters
26501 Ridge Rd.
Damascus, MD 20872

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

Transmitter Details
1Watt FHSS Transceiver.
5 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 50 Ω, 890-950MHz

4) 10.65dBi Yagi
    a. Manufacturer Laird PLC
    b. Model PC906N
    c. 50Ω, 896 – 940MHz 8.5dBd calculated to 10.65dBi
    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.
5) 4dBi Omni Low Profile 'Puck' shaped Antenna
    a. Manufacturer World Products INC.
    b. Model WPANT30026-S5A
    c. Model used in testing was WPANT30026-S5A
        i. 1meter coax with RPSMA connector.
        ii. Connection to the radio via RPSMA to U.FL adapter < 16cm long.
    d. Dual Band
        i. 4dBi 50Ω, 860 – 960MHz
        ii. 3dBi 50Ω, 2.4 – 2.5GHz – NOT Utilized

The 4dBi Puck antenna has no Duty Cycle Correction limitations for any data rate or power level.

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

1) 1Watt output Limitations for the Omni and whip antenna require 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
    d. 420kbaud – 4GFSK Data Rate – 210k symbol rate
2) 1/4Watt output no duty cycle limitations – 25 Hop Channels or more
    a. 620kbuad – 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 10.65dBi 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. 620kbuad – 4GFSK Data Rate – 310k symbol rate