Perceived Transmission and Reception

A *non-scientific* comparison between 2 antennas working 2M and 70 cm (440 MHz)

Ventura County Amateur Radio Club

Definitions

- **Transmission**
  - Electromagnetic power from a radio transmitter is coupled by the transmitter antenna into air or free space
- **Reception**
  - Electromagnetic waves are intercepted by a receiving antenna and coupled into the receiver for detection.
- **Perception**
  - To become aware by the senses. Hearing, smelling, etc...

Antenna Theory
Power = I^2*R

Credit: Reese West *

- **The shorter the antenna, the narrower the useable bandwidth.**
- **The radiated power varies as the square of the current.**
  - **If you double the current, you get four times the power.** **Power = I^2*R**
- **If you double active length, you get four times the radiation resistance, Rr.**
- **If you cut the length in half you get one fourth the radiation resistance, Rr.**
- **If you double the length you get twice the inductive reactance Xl.**

* Keyer Feb, 2022

Helical Antennas

- The dielectric body would function as a resonator and is commonly called a dielectric resonator (DR).
- Usually, a resonator is a device for energy storage, not energy radiation.
- Nevertheless, DR-loaded helical antennas have attracted much attention recently (1985).
- Because most of them are small in size, low in loss, and light in weight

Vaughan, R. G., and J. B. Andersen, Polarization properties of the axial mode helix antenna, IEEE Trans. Antennas Propag., 33, pp. 10-20, 1985

Helical Antennas

...from Compactenna

Credit: Jack Nillson (Inventor)

- **This New Science & Technology can also dominate performance of much longer standard antenna technology in Line of Sight Communications!**
- **The Magnetic Field Resonator is constructed of extended flat monofilar spiral Tesla-like coils + geometric components.**
- **Creates loss-reduction matching, efficient enhanced signal production, and reduced flutter.**

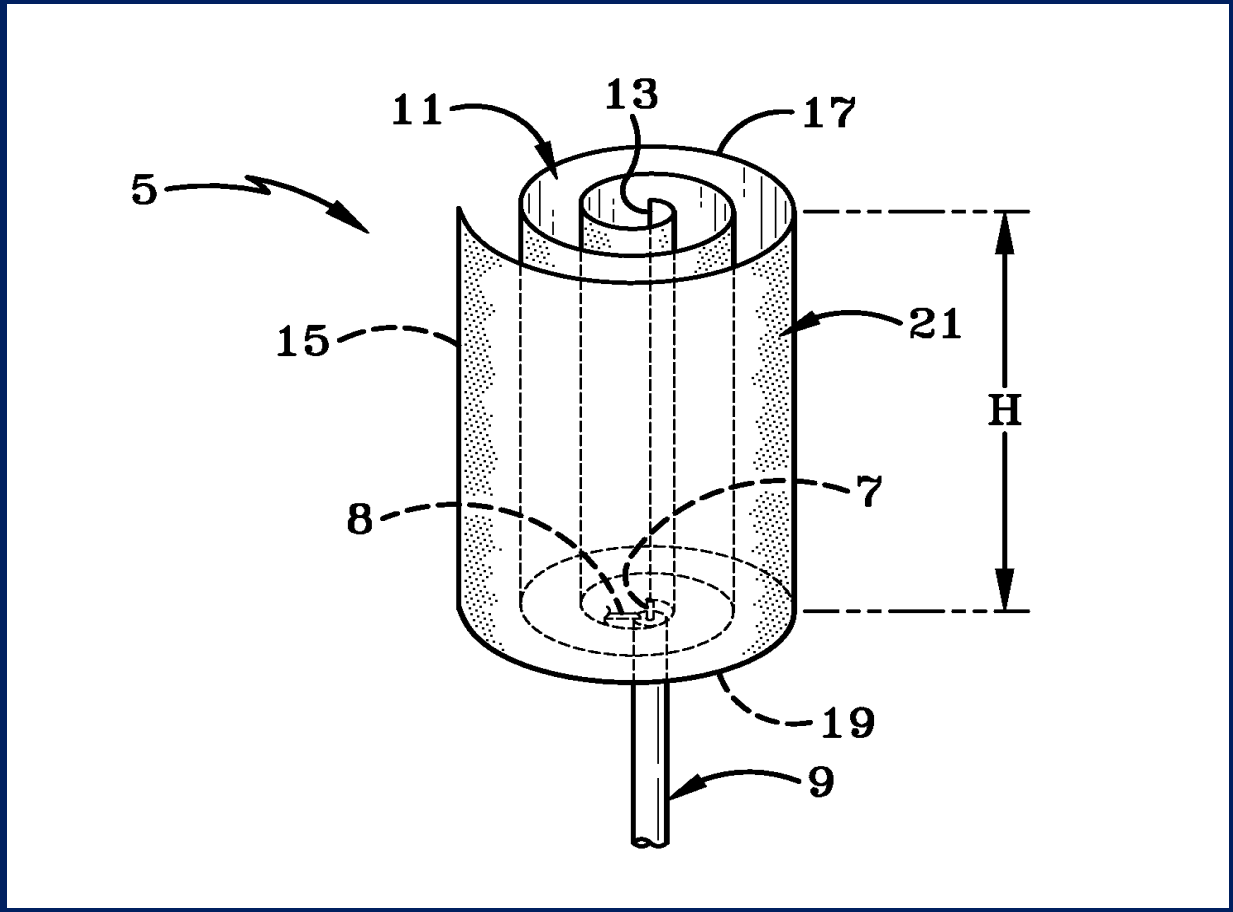
Tesla Coil

- Tesla coils were the first system ever built to transmit electricity wirelessly.
- It was revolutionary and works by using two coils and a power source to transmit electricity.
- One coil powers the other coil, and this allows the current to move through both to create a frequency.

Patent Number US20140022144A1

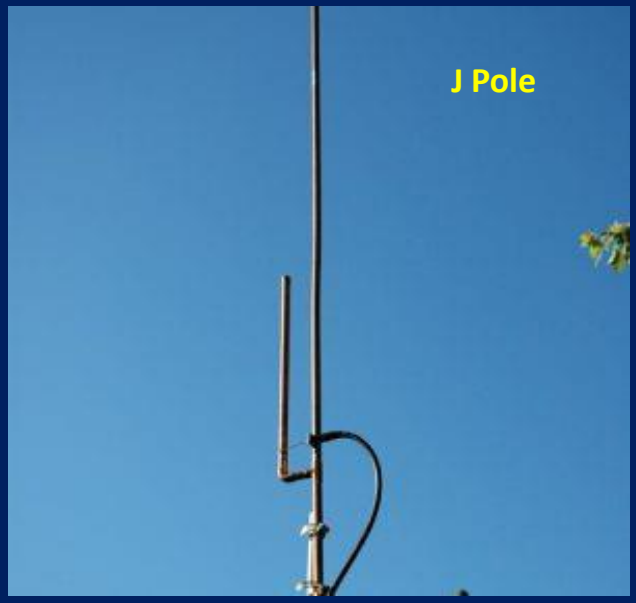
- Specifically, this invention relates to a radiative antenna element formed by way of a single-fed spiraled sheet of conductive material.
- The conductive material is interlaced with a dielectric material to form the radiative element.
- The radiative element includes a height of substantially less than ¼ of the characteristic wavelength of the lowest operating frequency.

Basic Drawing



Patent US 201400221144A1

Compared Home Base Antennas



Comparisons

- Home Base
  - Copper J-Pole and Ed Fong antennas
  - Compactenna with supplied counterpoise
  - Two geographical and environmental locations
  - Two different transceivers
- Mobile
  - Various commercial verticals
  - Vertical Mag mounts
  - Two different transceivers

Home Base Comparison

Self's comments:

J-Pole 2-Meter Base Antenna (KB9VR) & Compactenna Home Base

- Fed with RG-8 cable (~100 ft)
- Same Transceiver (Yaesu FT-7800R)
- 2-pole antenna switch
- Installed on Roof of House
  - Same Height (~ 20ft above ground, ~ above tile roof)
  - 30 ft apart
  - Mounted on PVC masts
  - Similar obstructions (trees, solar panels …??)

Home Base Comparison (cont.)

Self's comments:

Monday Night Net (Feb 28)

- Using EBY repeater (145.200)
  - 15 watts output
  - Switched between antennas during net announcements
  - No perceived differences (reception or transmissions)

Monday Night Net (Mar 14)

- Using Sulphur Mountain repeater (447.480)
  - 15 watts output
  - **Compactenna only**
  - No perceived differences (reception or transmissions)

Home Base Comparisons (cont.)

Robert's comments:

- Installed the Compactenna with a counterpoise on a 8' mast above my copper roof. I tested the SWR and it was very close to 1:1.2 and below.

- I ran it at several frequencies including 145.200 area 3 simplex. I found at most 2 dB difference between my Ed Fong triband antenna; the Compactenna was lower.

- It functioned well connecting to packet using OJAI as the digipeater and hitting all 22 functional packet EOC stations.

Mobile

Tram 1180 vs Compactenna

- 37.5" tall
- Stainless (?) NMO o-ring seal
- 144-148/430-450 MHz
- 150W
- 3 dBd gain on VHF and UHF
- ~$35 street price

NOTE: Two different Tram antennas used (one per vehicle)

- Aluminum NMO mount, no seal
- 144-148/430-450 MHz
- 85W VHF, 50W UHF
- 3 dBi + 1.5dB (2.90 dBd total but not sure of band)
- $99

• SWR – Truck

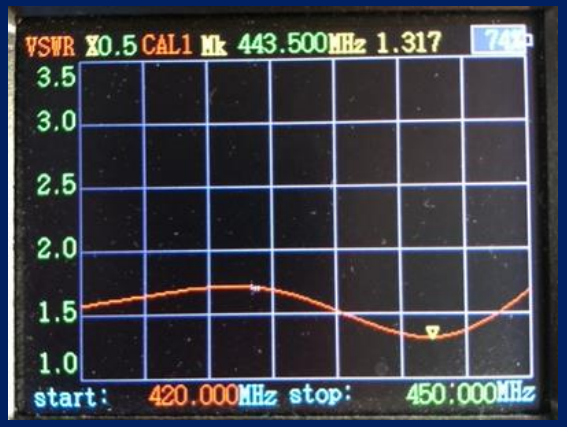
Tram 1180

VHF

UHF

Compactenna

Center of roof not ideal !
NOTE: Scale change



Wider bandwidth on UHF

SWR – eGolf

Tram 1180

VHF

Compactenna

Center of roof not ideal !
NOTE: Scale change

UHF

Wider bandwidth on UHF

Mobile Results

Dave's comments

Home driveway, Truck (East end Ventura, near 126 and Wells Rd)

- Kenwood TM-281A set to low power (20W) for VHF or TYT TH-350 HT for UHF (5W)
  - These were only 4 repeaters the Tram could open but the Compactenna
    - 145.240 Chatsworth Peak (30 miles)
    - 146.880 Ventura Red Mountain (11.7 miles)
    - 445.640 Ventura Red Mountain (11.7 miles)
    - 146.655 Diablo Peak on Santa Cruz Island (40 miles)
  - All other local repeaters worked well with Compactenna
  - Listening to ARRL Newsline over , 2-4 S points higher using Tram

Work parking lot, eGolf (Goleta)

- Anytone AT-779UV on high (~25W)
  - All repeaters I usually use, I could hit equally well with the Compactenna
    - 145.180 Santa Ynez Peak (9.6 miles)
    - 146.790 La Vigia Hill (8.76 miles)
    - 145.655 Diablo Peak Santa Cruz Island (30 miles)
  - **Engaged in a QSO using Diablo Peak, other party did not hear any difference between the Tram or Compactenna**

Mobile Results

Self's Comments (driving around Oxnard):

- Similar voice quality as Diamond NR770HBNMO
- Simplex mode, similar reach as Diamond NR770 HBNMO
- Reached all local repeaters
- Received good reports from Catalina repeater

Mobile Results (cont.)

Dave's comments:

- From 118 & Weller, in my truck, reception from a weak station would be 2 S points higher with my Tram than the Compactenna.

- Any edge that my Tram 1180 37" antenna had was very small. I could kerchunk into a couple of repeaters that the Compactenna could not, but my signal into them with the Tram was so poor anyways that I was unintelligible.

- From North Goleta, tried it on several repeaters and my signal was good regardless of which repeater I came into. One was Diablo Peak 146.655 out on Santa Cruz island.

Conclusions

Dave's comments;

- Compactenna works surprisingly well given its small size!
  - Very wide bandwidth inside designed bands. Wider than the Tram on UHF
- Compactenna SWR high for VHF if placed in the middle of the roof (inventor says edge of roof is better)
- Needs an NMO gasket
- I'd be worried about it getting hit and damaging roof
  - Base of Tram is not as high, whip can bend
- Personal taste – looks better on a truck than my eGolf
- If you don't want a whip, and you can mount it in a spot that looks aesthetically good, the Compactenna is a valid choice

Conclusions

- Performance
  - Similar to the ear
  - Similar transmission distance
  - Good SWR across amateur VHF/UHF bands
- Convenience
  - Lighter and Smaller
    - Easier to install, remove and store
- Price
    - Approximately $100.00