Natural Radio

News, Comments and Letters About Natural Radio

September 2004

Listening to the E-Field E-field receivers produce a lot of interesting sounds, most of which are readily identified by those who listen on a regular basis. Not all the sounds are desirable, we travel great distances to get away from the 50 or 60 hertz AC power mains and all the associated harmonics that are generated by various electrical devices, corona, and bad insulators. But there are other infrequent and sometimes more puzzling sounds that we sometimes hear.

A week or so ago, Shawn Korgan reported on the VLF_Group reflector that he heard the sound of a crop duster airplane through his E-Field receiver as it flew low over his house. Several theories were proposed for the generation of the ELF signals – from noise from the planes ignition, to the propeller modulating the earth's electrostatic field. It might be difficult after the fact to figure out which theory is correct, but the topic provided some lively discussion, as well as insight into some other phenomenon that various listeners had observed.

So, let's take a look at some of these phenomena and how they might be generated. Also, it might spark you to do some research and discover some other interesting uses for E-Field receivers. What are some of the ways that a signal can produce an output in your E-Field Radio?

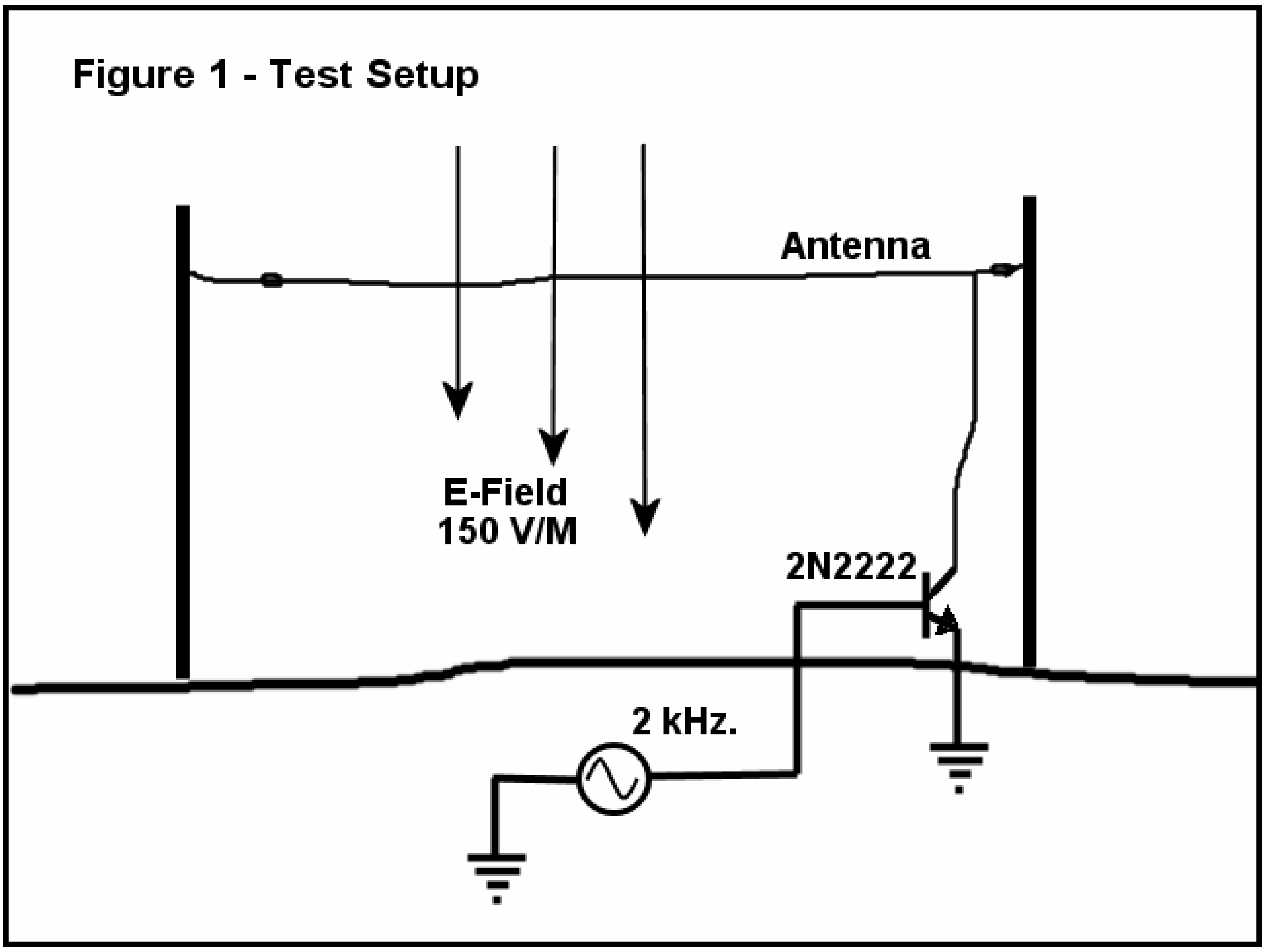
Modulation of the Electrostatic Field

The electrostatic potential above the earth's surface on a fair day is about 150V/meter. So, the average person has a potential difference from head to toe of about 800 – 900 Volts. Obviously, the current is low and thus the impedance of the air is high. During thunderstorms this potential can rise to over 10,000 V/M, and the current potential can be extremely high. As a matter of fact, some lightning warning systems function by measuring this field and setting off an alarm when it exceeds a certain potential.

Most of us who have used E-Field receivers have been startled by the sound of a curious dragon fly or bumblebee investigating our antenna. The beating wings disrupt the electrostatic field in the vicinity of the antenna and make one either throw off the headphones or go into a fit of swatting virtual bugs around our ears.

I decided to do a quick and dirty test to see if it was possible to modulate the electrostatic field by shorting it out like an airplane propeller might do. Here's the procedure I used. There's a wire antenna in my backyard that is about 15 feet off of the ground. I connected the antenna to ground through a transistor and applied a 2kHz. signal to the base of the transistor to turn the transistor on and off, thus grounding the antenna at a 2 kHz. rate. See Figure 1. Walking under the antenna with my WR-3 produced a quite audible 2 kHz signal in the phones that I could hear up to about 20 feet or so from the antenna.

Thus, it seems like it is possible to modulate the electrostatic field by shorting it out. Now, this was a crude experiment and I will want to repeat it using an opto-isolator instead of the transistor just to make sure that the 2 kHz modulating signal isn't somehow leaking into the antenna, but the results look promising.



Would it be possible for a rotating airplane propeller to short out the E-Field above a listener enough to produce an audible signal? Hard to say without some exacting measurements, but I think my little experiment puts it in the realm of possibility. It would definitely be worth sitting at the end of a runway with a WR-3.

RF Sources

The sounds that we want to hear are RF waves that propagate to our antenna like sferics, tweeks and whistlers. But there are other sources of RF like power line noise and any kind of static discharge.

Tires also can create emissions. One of my listening sites was near a road and each passing car generated a burst of hiss not unlike a roll of masking tape being unrolled. Bicycles going by produce the same noise. Tires can produce static levels that charge the car to a fairly high potential, causing a nasty shock when one exited, or worse yet ignite gasoline fumes when refueling. This was a problem with early automobiles, until manufacturers later began adding a high level of conductive carbon black to tire formulations that discharged most of this static. This charging and slow discharge through the tire to the road is probably what generates the signal.

Some newer tires have replaced the carbon black with silicon for less rolling resistance, causing an increased problem with static build up, much to the chagrin of toll collectors who are getting zapped along with the toll. Unfortunately, it has also been blamed for an increase in pump fires at gas stations.

To observe this type of static discharge, go into a dark closet and quickly pull a piece of black electrical tape away from the roll while watching the place where the tape pulls away from the roll. You'll see a blue glow from the static electricity discharge, and if you have your WR-3 in there with you, you'll hear it.

And of there is course my oft mentioned cat rubbing against my leg and generating static discharges that are directly coupled into the antenna through its ground plane – my leg.

Charged Particles

Charged particles moving past the antenna will create noise. If you've ever used your E-Field radio in a moving car, you have heard the wind noise produced by charged particles in the air.

In the ongoing discussion about the sound that Shawn heard from the airplane, another experimenter reported that he had heard a noise ". . .like masking tape being pulled off a roll", several seconds after a helicopter passed over. It obviously wasn't RF or field modulation since the helicopter was close and several seconds passed between the time the helicopter flew over and when the sound was heard. Someone on the reflector suggested that the helicopter kicked up fine water droplets from the ocean and they became charged – possibly from the helicopter. When the cloud passed the antenna, noise was heard.

Ion clouds

Ion clouds are not something we are going to encounter very often, but they could possibly be produced by high voltage corona and high temperature combustion gasses. Charged ions moving past your antenna will alter the electric field and thus have the potential for producing some type of sound.

Years ago, back in the days of vinyl LP records, there was an audiophile device being sold to aid in the removal of dust from records. This product resembled a gun. You pointed the device at your LP and pulled the trigger to send a shower of positive ions in the direction of your LP thus neutralizing its charge and making the removal of noise producing dust particles easier. Pulling the trigger deformed a piezoelectric element that produced a high voltage spark which created the positive ions. I don't have one anymore but it would be interesting to point one at an E-Field antenna.

Another potential ion generator is certain electronic air cleaners.

Microphonics

Charged particles and ions moving past your antenna will produce a signal in your receiver, but a static field can produce a field if the antenna moves through it. If the antenna can be made to vibrate at an audio frequency, you will definitely hear it. If you are listening to frequencies around the Schumann resonance, antenna stability is a major factor.

So there's something to think about and experiment with as the weather gets colder and static build-up increases. There's more out there than sferics, whistlers and tweeks.