

Power Line Noise

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Power Line Noise is a major source of interference to VHF DX. It is usually said to be due to dirty insulators but this summary dismissal of the cause masks a much more complex mechanism which seems to be only partly understood. The common name "Power Line Noise" is itself misleading, as is "Power Leak", another common name. The noise arises from the flow of current across ionized air gaps in the leakage path from the power lines to ground at the supporting poles. Gap Discharge Noise is therefore a more appropriate name for it.

The Mechanism

The various parts of a power pole below the line insulators are meant to operate at approximately ground potential but this situation obtains only if all of those parts are connected to each other and to ground. If they are not, potential gradients will exist across the interface gaps. The potential gradients will exist due to current flow across dirty or damaged insulators or because of induction coupling. When the potential across any gap rises to the point at which the air ionizes, sparking will occur across the gap and radiate radio noise. Because it is AC the noise will be modulated at 50Hz and harmonics, due to non-linearities in the ionization process. Frequently the expansion of heated gas due to the sparks will also produce audible noise.

Effect of the Weather

Gap discharge noise is a dry weather phenomenon. In the event of rain, heavy dew or fog, wood swells and closes some of the gaps, and moisture with dissolved impurities penetrates them all. This increases the conductivity and reduces the potential across the gaps to the point where ionization cannot occur. The system becomes as it was intended - a unipotential ground system. Gap discharge noise ceases. After a prolonged period of dry weather an intermediate stage is often observed when heavily polluted insulators are moistened to the point where current flow increases across the surface mud which has not yet been washed away. This raises the potential across gaps and the noise increases until the insulator becomes clean.

Installations, Engineering and Maintenance

Power line noise of a different type occurs as a result of corona discharge from high voltage installations, but this is not the main problem for VHF DXers because corona discharge requires voltages of order 50kV or more. Gap discharge is the sole source of noise at lower voltages. The intermediate level 11kV installations commonly found in suburban streets (at least in Sydney) are the worst. Part of this stems from the fact that they are poorly engineered in relation to the voltage. Insulators are only marginally bigger than those used on 240V, and the cross arms are a little higher on the pole. That seems to be as far as it goes. Maintenance in the form of insulator washing and regular bolt tightening used to be fairly common. The private companies now responsible for power distribution no longer do this.

Gap Discharge Noise Sources

- On the insulator: The line to insulator joint, insulator contamination, insulator fractures and surface crazing, insulator to mounting bolt joint, insulator bolt to cross arm joint.

- On the pole: Cross arm to pole joint and bolt, cross arm to brace joint and bolt, cross arm brace bolt head and overlap joint*, guy wire to metal sleeve joint, guy wire clamps, pole caps and grounding wires - anywhere there is a join between any two parts.

* This is probably the worst of all. The two cross arm braces should be welded at this point and the bolt should be a bolt through the pole - not simply a coach screw, which is often the case.

Fixing a bad case

Complain to the Power Company, complain to your local MP.

Ask neighbours if they have bands of spots drifting up their TV screens. If so explain what is causing it and ask them to complain also. Do not let it rest.