

# Polarization

## How To Make A Radio Wave

Back on the [Intro Page](#), we were introduced to the idea of frequency and I wrote that

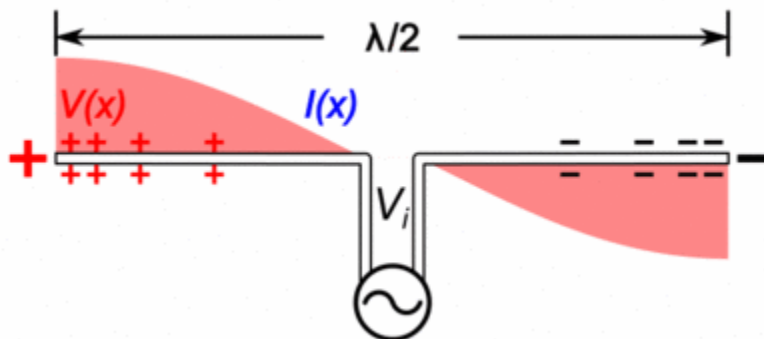
A Hertz (Hz) is a measure of how fast something vibrates [...]

Just seeing “Hz” doesn't tell you anything about what it is that's oscillating in the same way that seeing “°C” doesn't tell you anything about what it is that has temperature. “Hz” is a unit of measure, not a thing itself.

Without going into too much detail (yet), radio waves are created by oscillating electric currents. How many times this current oscillates per second is called the frequency, which is measured in Hz (or kHz, MHz, GHz).

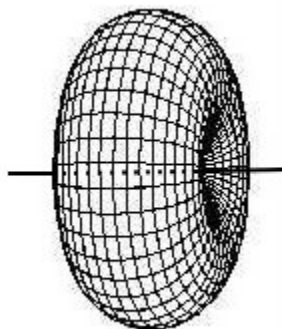
Here is a basic recipe for making a radio wave

1. Get a length of conducting wire and lay it in a straight line.
2. Cut it in half right in the middle and bend both ends at right angle.
3. Connect the two middle ends to each side of an alternating current generator.



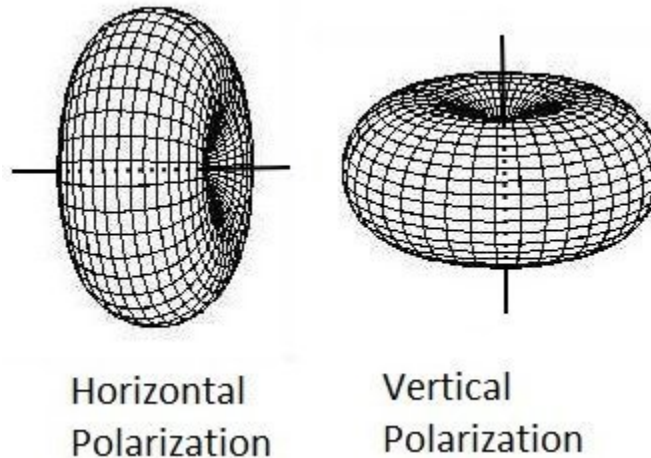
Voila, assuming that the length of the antenna (the two pieces of wires) match the frequency of the current generator, and that the antenna is high enough above the ground, you've created a radio wave.<sup>1)</sup>

So what happens is that as electrons move up and down the length of the wires, they create a varying electric and magnetic fields that couple and propagate outward in a doughnut shape<sup>2)</sup>



## Horizontal vs Vertical Polarization

Here's the critical part though: In the same way that an alternating current through an antenna creates a radio wave, a radio wave hitting an antenna induces an alternating current through it **if the radio wave hitting the antenna is in the same "direction" as the antenna.**



This "direction" is called polarization.

## Effect on Communication

In practice, polarization is more important for VHF and UHF communication because signals go directly from the transmitting station to the receiving one.

For skywave HF communications, the ionosphere can change the polarization of the signal from moment to moment as the radio wave refracts, reflects, or goes through magnetic fields. As such polarization of the antennas on HF frequency doesn't matter much.

## Questions

- B-007-004-007
- B-007-004-010
- B-007-007-002 → B-007-007-011

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1)

GIF from  [Wikipedia Dipole Antenna](#)

2)

Picture modified from  [Wikipedia Dipole Antenna](#)