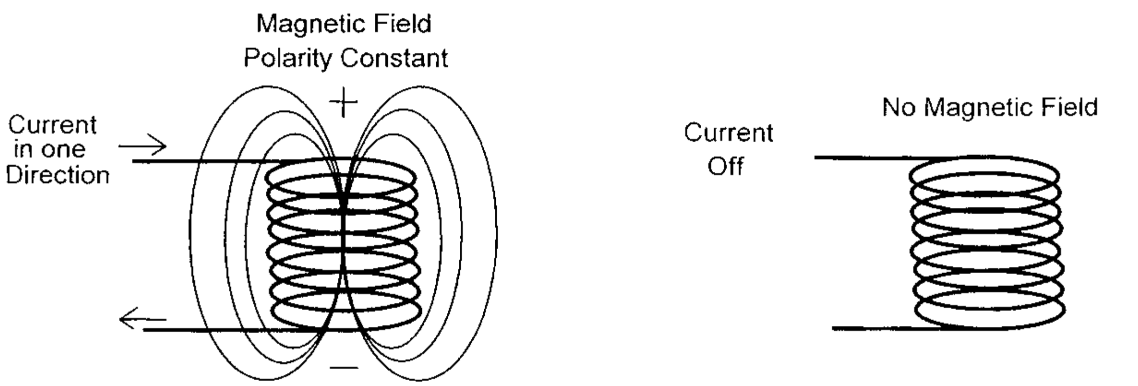
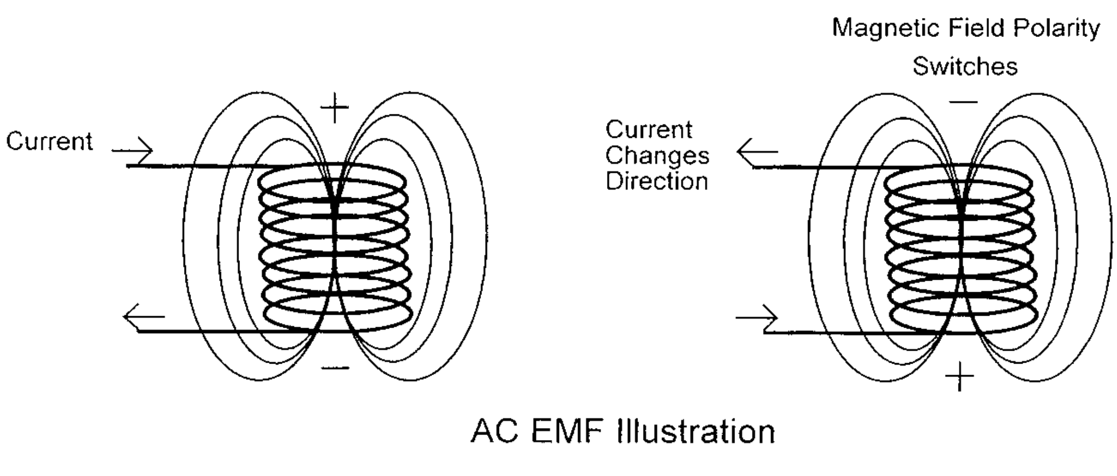
Pulsed and AC Electromagnetic Fields Vs. Dynamic DC Magnetic Fields

This paper is intended to clarify the important differences between pulsed and AC electromagnetic fields (PEMF and EMF) and dynamic DC magnetic field (DDCMF), specifically as they relate to magnetic therapy. The purpose of this clarification is to differentiate the magnetic therapeutic device called the PalmMag 1000 from other types of time-varying magnetic field devices.

First, let's look at exactly how a pulsed or AC magnetic field is generated. A very simple example would be to take a coil of wire and periodically cause a currant to flow through it. If the current flows in one direction it would create a pulsed magnetic field emanating from the coil. If the current alternates back and forth it would create an AC magnetic field. These concepts are illustrated below:



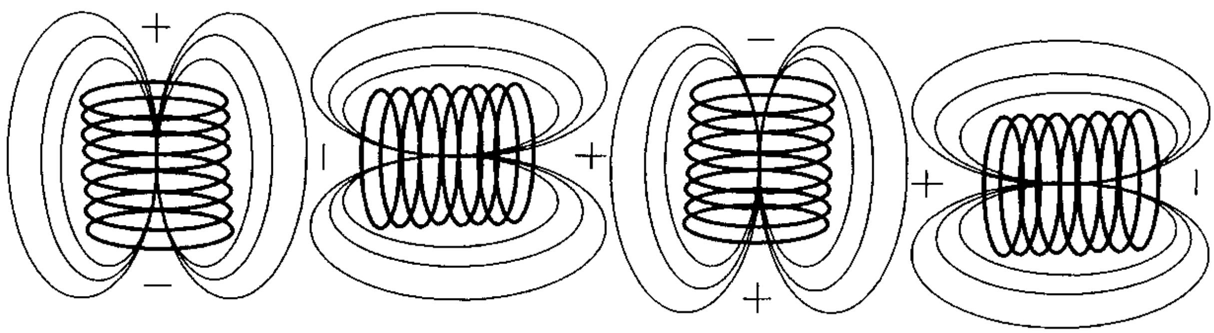
PEMF Illustration



AC EMF Illustration

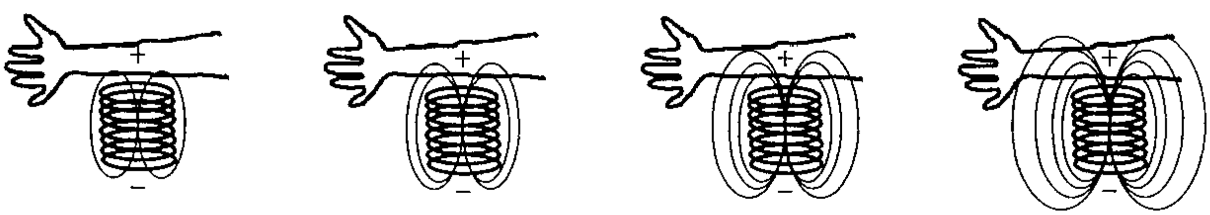
The plus and minus signs over the coils represent magnetic polarity, not electrical. The plus sign customarily signifies south polarity and the minus north polarity. However, it should be noted that an electric field is also present which pulses and alternates at the same frequency as the current, hence the term electromagnetic field (EMF). Also, the intensity of the magnetic and electric field is directly proportional to the amount of current passing through the coil. Hence, the magnetic field generated from a coil receiving 2 amps of current will be twice as strong as the magnetic field generated from the same coil receiving only 1 amp.

Let's see now how a dynamic DC magnetic field differs from the PEMF and AC EMF. The DDCMF starts off very much like the PEMF. Using the coil example, a direct current is passed through a coil of wire generating a magnetic field with a constant polarity. But here is where the similarities end. The current passing through the coil never turns off or reverses direction, but remains constant. Then, the entire coil is caused to rotate bringing the magnetic field surrounding it along for the ride. This is illustrated below:

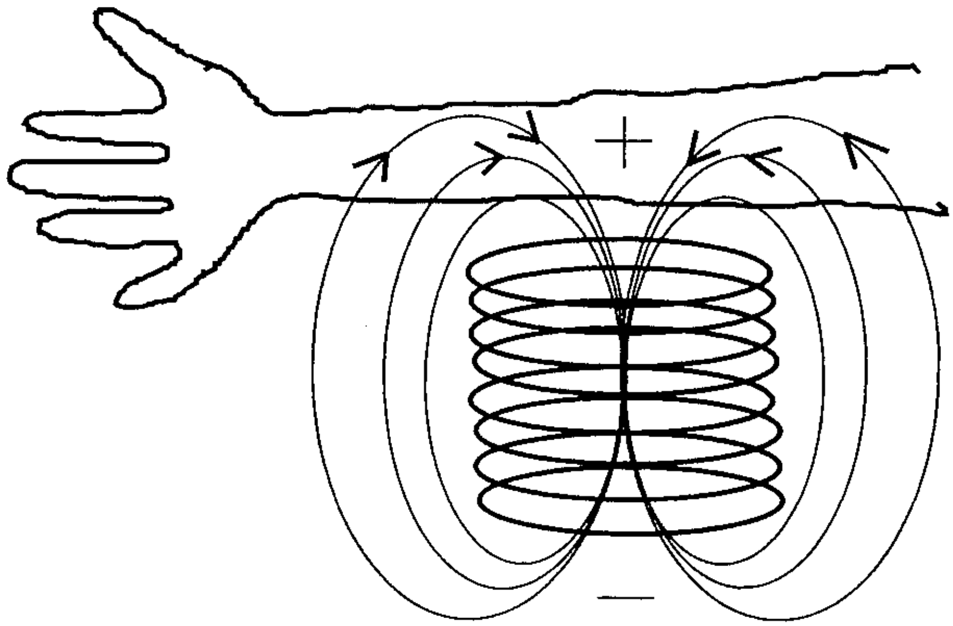


DDCMF illustration

The question now arises, "why is this significant"? Well, in terms of magnetic therapy this is very significant because the lines of magnetic force passing through biological tissue behave much differently among the different types of magnetic fields. Let's look first at how a PEMF would impinge upon a part of the human body; an arm, for instance:



The above illustration shows how the field grows and expands out from the coil into the arm. In a PEMF there is a periodic expansion and contraction of the field as the current is turned on and off through the coil. The magnetic lines of force (flux lines) follow one path through the tissue as the field expands and contracts. A close-up reveals this in greater detail:



The same is true for the AC EMF, except that the field changes polarity periodically which causes the magnetic lines of force to reverse direction through the tissue. In both the PEMF and AC EMF the flux lines follow the same path, and the intensity of the flux (the number of lines of magnetic force) increases as the field expands and decreases as the field contracts. Now, let's take a look at what happens with a DDCMF:

It is clear to see from the above illustration that the paths of the magnetic flux lines are continually changing. This is very significant because the targets of magnetic therapy are the nerves in the body. Neural orientation is a generally random situation. Applying a magnetic field to optimally effect a given nerve is a hit or miss proposition. By continually changing the path that magnetic lines of force follow, an increased probability of optimal magnetic/neural interaction occurs. The PalmMag 1000 goes one step further and continually changes the flux path along two rotational axes, instead of one. This added dimension of spatial influence greatly enhances the probability that more nerves will be optimally affected by the magnetic field.