

## Alternating Fields

### ELF Magnetic Fields

#### A Primer For All

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The “traditional” power quality environment has focused primarily on what can be described as “conducted power quality events”. These events would typically include a mix of measurable anomalies (i.e. transients, surges, sags, harmonics, etc.) found by direct measurement of the voltage and current waveform. In this day and age, one is quick to realize that the ever increasing application of new technologies in all areas of our daily lives, has dramatically increased the complexity of the so-called “traditional” power quality environment. In reality, this new “electromagnetic” environment is filled with events that can be both “conducted” and/or “radiated”, and where analytical measurements are taken in both time and/or frequency domain. The present day spectrum of this “electromagnetic environment” spans from 0Hz(DC) to frequencies in the GHz range and beyond. As our modern environment, forces you to venture away from traditional power quality themes, your most likely first encounter with “non-traditional”, “radiated” power quality phenomena will be the discovery of Extremely Low Frequency (ELF) Electromagnetic Fields (EMF).

The intent of this article is to introduce you to this important player within the broad scope of our total electromagnetic spectrum. I hope that with your feedback and participation, we will be able to make this column a valued regular feature of PQ Today.

To paraphrase a well-known cliché, “there are only two types of power quality professionals, those who have dealt with ELF EMF problems and those who are going to”. As such, it is of utmost importance that you increase your technical knowledge and ability to effectively deal with, and recognize, the important issues surrounding ELF EMF’s. With a proper sound understanding of the possible causes and effects of ELF EMF’s, you will begin to expand your knowledge of the complete electromagnetic environment.

Extremely Low Frequency(ELF 20 - 2000Hz) Electromagnetic Fields(EMF) are alternating magnetic fields that can be found in all environments where alternating current is found. They are created by alternating current flowing through electrical conductors. It is the magnitude of the net current that will determine the strength of the magnetic field. The frequency of the field is determined by, and will match, the fundamental (predominantly power line frequency) and harmonic frequencies of the current waveform.

Our first awareness of these fields has typically occurred through various forms of reporting by the media. The media has traditionally focused it’s attention in this area on numerous reports of a possible association between ELF EMF’s and health risks. Because of this, the realm of ELF EMF’s has often been left to the health and biological sciences professional. While there are exceptions, many power quality professionals consider ELF EMF’s to be outside the realm of “power quality”. It has only been in recent years, because of the effect that ELF EMF’s have had on computer monitors (i.e. CRT image distortion), that the study of ELF EMF’s has reintroduced itself to the power quality professional.

This is a good thing, because in a large percentage of cases, the ELF EMF sources themselves are faults and/or errors in electrical distribution wiring, an area in which the power quality professional is well versed. So, while the debate over potential health effects continues to be inconclusive, our present skills and inventory of power quality equipment can be cleverly applied and/or adapted to providing effective treatment of ELF EMF problems today.

If you haven’t yet dealt with ELF EMF’s, your first involvement will most likely take one of two forms, most often beginning with the first and leading to the second. The first will be an issue related to equipment performance problems pertaining to the level of ELF EMF’s near the affected piece of equipment. The

second will be the issue related to health and safety. In the first case, you will find that 99% of the time, the affected equipment is a cathode ray tube(CRT, i.e. computer monitor) showing pronounced visible distortion(i.e. jittery image). In the second case, the issue of possible health risks will be the primary concern. Solutions to the first item are easily understood, but when you get to the second stage, you will enter one of the most controversial technical debates of our decade.

With over 13 years of experience in dealing with ELF EMF Issues PowerCET Canada is ready to help you.

If you have any related questions and/or feedback, please call((613)739-8084) or email me at [marcb@powercet.com](mailto:marcb@powercet.com) .