

## ELF Interference Sources and Indications in Low Voltage Signal Telecommunications

As the world relies more on high speed data transmission, the requirement for system reliability becomes all the more critical. This is especially true in the fixed land-line segment of this industry. Customers require consistent reliable communications. Contractual agreements that state vendor penalties in the event of communications outages are an indication of this importance. It is for this reason that signals infrastructure contractors are looking at innovative tools and methods to insure the best possible installation of their low voltage networks.

Extremely Low Frequency (ELF) interference is a little known segment of the broader EMF spectrum of signal propagation interference. ELF radiation is commonly described as Magnetic Flux Density measured in Gauss or Tesla units. The relationship between the ELF (3-30Hz) radiation and its effects on signals communication are not well understood or documented. The industry accepted maximum level of Gauss is 5mG within 2" of the signal wire.

Common sources of this type of interference are electrical components operating at 60Hz (50Hz internationally). This can be anything from kV rated overhead power lines, 480 VAC lines supplying electrical transformers, to common electrical devices operating at 120 VAC (240 VAC internationally) in the area of the communications equipment. Most installation technicians are unaware of the fact that such common items found in most office areas such as HVAC equipment, florescent lights, microwave ovens, computer terminals, and even low voltage AC to DC transformers emit enough ELF radiation to disrupt Ethernet, USB, and Cable communication lines if placed in close proximity to the hardware. Areas of particular concern are telephone switching rooms found in larger office complexes. In many instances the telephony hardware is located in close proximity to the power supplies that run this equipment.



Example of ELF radiation located in a typical telephone switching room and how to detect it

The most effective way to determine if this ELF frequency is a factor in signal degradation is with the use of an ELF Meter. These meters incorporate three coils to that are electronically designed to detect this frequency range. They measure in all three axis to determine the field strength by using the vector

summation principal. They are extremely accurate instruments, and are able to determine the Gauss level at any point in space regardless of orientation with 1% accuracy. Some ELF meters incorporate software that allows the technician to download the displayed information to a PC, allowing the operator to have a permanent record of the Gauss levels found during his/her inspection. Generally, if the readings are below the 5mG level 2" from the signal lines he/she can be assured that there will be no ELF radiation interference in that circuit. Also, if the customer indicates slow communications or intermittent disruptions, the ELF meter can be used as an efficient troubleshooting tool to determine if any ELF radiation is present near the circuit.

---

Mark Green is an Applications Engineer at FW Bell, a division of Sypris Test & Measurement. Please forward questions or comments to [mark.green@sypris.com](mailto:mark.green@sypris.com)