stress the system for long periods of time may constitute a health hazard. An adverse health effect causes detectable impairment of the health of the exposed individual or of his or her offspring; a biological effect, on the other hand, may or may not result in an adverse health effect.

It is not disputed that electromagnetic fields above certain levels can trigger biological effects and short-term exposure to very high levels of electromagnetic fields can be harmful to health. Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the house do not cause any apparent detrimental effects. Exposures to higher levels that might be harmful are restricted by national and international guidelines. The current public concern is centered on whether long-term low level exposure can evoke biological responses and influence people's well-being.

The Institute of Electrical and Electronics Engineers (IEEE) and many national governments have established safety limits for exposure to various frequencies of electromagnetic energy based on is the specific absorption rate (SAR, W/kg), mainly based on International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines, which guard against thermal damage.

These safety limits require electromagnetic radiation shielding to be applied when necessary. Shielded enclosures generally surround a product’s circuitry in all sides. On the other hand, it is not uncommon to find shields that don’t surround the entire product. Often a shield partially covers only a few circuits. These shields may be penetrated by unfiltered wires and sometimes consist of a single plate of metal.

It is convenient to divide enclosure or component shields into 3 categories: electric-field shields, magnetic-field shields and shielded enclosures. The best shielding strategy in any given application depends on a number of factors including the electrical characteristics of the circuit or system being shielded, physical constraints (e.g. size, weight and accessibility) and cost.

A perfectly conducting enclosure that completely surrounds a given volume prevents anything within that volume from electrically coupling to anything outside that volume. This type of enclosure is called a Faraday cage. Electric fields generated within the volume either terminate on objects within the enclosure or on the inner surface of the enclosure wall. Free charge on the enclosure relocates itself as needed to exactly cancel the fields within or external to the enclosure. Most metallic enclosures without significant seams or apertures provide excellent electric field shielding over a wide range of frequencies.

The key concepts for practical electric field shielding are choosing a location that will intercept the stronger field lines and choosing a suitably conductive shield material. For static electric fields, almost any material will look like a conductor since the free charge can slowly transfer itself. However for high-frequency electric fields, the conductivity of the shield material must be high enough to allow the charge to move quickly back and forth.

It is often desirable to combine shielding function with structural or other functions. While metal shields can often be used to combine functions in this manner, often the use of metal parts has definite disadvantages. Where weight is a factor, metal parts are often too heavy. Also metals cannot be molded into highly convoluted shapes. When a lightweight or highly complex shaped part is desired, it is preferable to use a composite material. Such conductive composites generally comprise a thermosetting or thermoplastic matrix containing a conductive material.

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MICROCIRCULATION PARAMETERS INVESTIGATION

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The role of microcirculatory disfunction is increasingly being recognized in the pathogenesis of many disease conditions. This is the subject of considerable studies to determine the exact nature of these disturbances. The techniques for investigating microcirculatory function have evolved almost exponentially over the last 75 years.

The term «microcirculation» describes the network of small vessels embedded within the organs that are responsible for the distribution of blood and the fluid exchanges within the tissues. Thus, microcirculation differs from macrocirculation, which is formed by larger vessels that transport blood to and from the organs.

The main functions of the microcirculation include the regulation of blood flow and tissue perfusion, blood pressure, delivery of oxygen and other nutrients and removal of CO_2 and other metabolic waste products, and body temperature. Therefore, microcirculation is a complex system that plays an important role in the hemodynamics of the body, by regulating blood pressure and venous return to the heart. It regulates the balance between oxygen demand and supply of parenchymal cells. In addition, microcirculation interacts extensively with the immune system and the body's defense mechanisms.

With the constant improvement of diagnostic tools, scientists and physicians have realized that many problems affecting patients may occur in the microcirculatory system. The most significant issues related to monitoring microcirculation parameters.

Nowadays the methods of noninvasive diagnostic of microcirculation parameters are acknowledged to have been great results. The use of laser Doppler techniques and laser speckle techniques is well known in the noninvasive investigation of microcirculatory blood flow. A non-invasive optical technique would have advantages both for a patient (no injection of potentially damaging chemicals) and for scientists and physicians.

Laser Doppler measures the total local microcirculatory blood perfusion including the perfusion in capillaries (nutritive flow), arterioles, venules and shunting vessels. The technique is based on the emission of a beam of laser light carried by a fiber-optic probe.

The light is then scattered and partly absorbed by the tissue being studied. Light hitting moving blood cells undergoes a change in wavelength (Doppler shift) while light hitting static objects is unchanged. The magnitude and frequency distribution of these changes in wavelength are directly related to the number and velocity of the blood cells in the sample volume. The information is picked up by a returning fiber, converted into an electronic signal and analyzed. The measuring depth depends on tissue properties such as the structure and density of the capillary beds, pigmentation, oxygenation, etc. It also depends on the wavelength of the laser light, and on the distance between the sending and receiving fibers in the laser Doppler probe. Many workers have used the Doppler approach to measure blood flow and the technique is now almost a routine tool in medicine.

Laser speckle is an interference pattern produced by light reflected or scattered from different parts of the illuminated surface. When an object moves, the speckle pattern it produces changes. For small movements of a solid object, the speckles move with the object, i.e., they remain correlated. This has been exploited in a technique known as «double-exposure speckle photography». By scanning the laser beam across the speckle pattern, a map of local movements can be built up.

The experimental setup for laser speckle contrast imaging is very simple. Diverging laser light illuminates the object under investigation, which is imaged by a CCD camera (or equivalent). The image is captured by a frame grabber (or equivalent) and the data passed to a personal computer for processing by custom software. The operator usually has several options at his disposal.

If the object under investigation contains moving scatterers, such as blood cells, each speckle will be fluctuating in intensity. A time-integrated image therefore shows a reduction in speckle contrast because of the averaging of the intensity of each speckle over the integration time. In practice, the exposure time can be very short, typically 0,02 seconds, and the processing time is less than one second for the whole frame making it effectively a real-time technique.

It can be shown, however, that the two techniques yield the same mathematical formula connecting the frequency of the fluctuations and the velocity of the scatterers – they are simply two different ways of looking at the same phenomenon. The main principles of two different methods of noninvasive investigation microcirculation parameters have been outlined.

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DIMENSIONALITY REDUCTION FOR PATTERN RECOGNITION SYSTEM

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For nearly a century, researchers have investigated and used mathematical techniques for reducing the dimensionality of vector valued data used to characterize categorical data with the goal of preserving “information” or discriminability of the different categories in the reduced dimensionality data.

Pattern recognition deals with mathematical and technical aspects of classifying different objects through their observable information, such as grey levels of pixels for an image, energy levels in frequency domain for waveform and the percentage of certain contents in a product. Conventional pattern recognition systems have two components: feature analysis and pattern classification, as shown in Fig.1.