

MAGNETIC-FIELD EXPOSURE

After reading the concerns and opinions expressed in the Letters section of the July 1991 issue of **Radio-Electronics**, I thought the position of the American Conference of Governmental Industrial Hygienists (ACGIH) concerning exposures to magnetic fields should be expressed.

First, a definition is in order. The standard of measure used by the ACGIH is the Threshold Limit Value (TLV), which represents "conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse

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health effects." Second, a distinction is made between "Static Magnetic Fields" and "Sub-Radiofrequency Magnetic Fields." the ACGIH (1990-91) recommended exposure limits are as follows:

Static Magnetic Fields: Routine occupational exposures should not exceed 60 milliTeslas (mT)—equivalent to 600 Gauss—over the whole body or 600 mT (6000 Gauss) to the extremities on a daily, time-weighted average basis. A flux density of 2 Teslas is recommended as a ceiling value. Safety hazards from the mechanical forces exerted by the magnetic field upon ferromagnetic tools and medical implants may exist. Workers having implanted cardiac pacemakers should not be exposed above 1.0 mT (10 Gauss). Perceptible or adverse effects may also be produced at higher flux densities resulting from forces upon other implanted ferromagnetic medical devices, e.g., suture staples, aneurism clips, prostheses, etc.

Sub-Radiofrequency Magnetic Fields (30 kHz and below): These TLV's refer to the amplitude of the magnetic flux density (B) of sub-radiofrequency magnetic fields in the frequency range of 30 kHz and below, to which it is believed that nearly all workers may be exposed repeatedly without adverse health effects. The magnetic field strengths in these TLV's are root-mean-square (RMS) values. Those values should be used as guides in the control of exposure to sub-radiofrequency magnetic fields and should not be regarded as a fine line between safe and dangerous levels. Routine occupational exposure should not exceed $B_{TLV} = 60 \text{ mT}/f$, where f is the frequency in Hz. At frequencies below 1 Hz, the TLV is 60 mT (600 Gauss). The permissible magnetic flux density of $60 \text{ mT}/f(\text{Hz})$ at 60 Hz corresponds to a maximum permissible flux density of 1.0 mT. At 30 kHz, the TLV is $2 \mu\text{T}$, which corresponds to a magnetic field strength of 1.6 A/m. For workers wearing cardiac pacemakers, the TLV may not protect

against electromagnetic interference with the pacemaker function. The TLV for pacemaker wearers should be reduced by a safety factor of ten.

Of course, there currently is not a clear understanding of the health effects resulting from exposure to magnetic fields (especially low-intensity, low-frequency ones). I hope that this information will help to clarify what is considered safe exposure to magnetic fields.

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