

§7. Health Effects of Non-ionizing Radiation at Magnetic Fusion Experimental Facilities

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Non-ionizing radiation (NIR) is a general term for both radiation and fields that form part of the electromagnetic spectrum having insufficient radiated energy to produce ionizing in the medium through which it passes. In magnetic fusion experimental facilities there are some kind of NIR sources. Representative devices are super conductive magnets, plasma heaters of high frequency wave generator like an electron cyclotron resonance heater (ECH) and an ion cyclotron resonance frequency (ICRF). The other is electron cyclotron resonance heater for discharge cleaning. Extremely low frequency (ELF) electric and magnetic field of 50/60 Hz is produced around the electric power sources and large electric devices. By the way, health risk caused by chronic exposure to low frequency, low electric and magnetic fields has generated considerable debate among scientist and public officials. Although some epidemio-logical studies reported positive effects, most of the invitro studies reported negative results. However occupational long term exposure to relatively strong electric and magnetic fields (EMF) should be prudently concerned and be restricted to reasonable level. To present provisional guide lines for limits to EMF exposure, helpful discussions were made with many specialists of biological or health effects to EMF. Major topics and coresearchers are as follows.

(1) Biological or health effects of static magnetic field. T.Shiga (Osaka Univ.), M. Iwasaka (Univ. of Tokyo), K. Matsunami (Gifu Univ.), K. Mori (Ibaraki Pref. Univ. of Health Sciences).

(2) Cellular and molecular biological effects of extremely low frequency EMF; J. Miyakoshi (Kyoto Univ.) , T. Koana (Railway Tech. Res. Inst.), K. Asano and T. Sato (School of Med. Showa Univ.)

(3) Biological effect of radiofrequency fields of cellular telephones; K. Imaida (Nagoya City Univ.)

(4) Measurements and instruments of EMF; K. Isaka (Tokushima Univ.), Y. Kamimura (Utsunomiya Univ.).

(5) Epidemiology and risk analyses; T. Okubo (Natl Inst. of Public Health), M. Kabuto (Natl. Inst. for Env. Studies), T. Kawamura (Nagoya Univ.).

(6) Protection and guide lines for variable EMF; M. Taki (Tokyo Met. Univ.)

As result we have presented limited guide lines applicable to NIFS for occupational and public exposure to static magnetic field and variable EMF. Discussions with many coresearchers and guide lines approved by ICNIRP (International Commission on Non-Ionizing Radiation Protection) were very helpful to decide the criteria. We tried to measure the EMF distribution in Toki site using various monitors. Then it was confirmed that restricted level could be measured by commercially available monitor in less than 3 GHz. Incase of high frequency radiations, thermal absorption rate to biological tissue is required to measure. But it is difficult to detect very low absorbed thermal energy. The next goal is to establish the monitoring system for wide range of radio frequency at the magnetic fusion experimental facilities.