

## §8. Environmental Electric and Magnetic Fields Monitoring at LHD and Related Devices

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Environmental electric and magnetic fields around the Large Helical Device (LHD), which has strong magnetic force, and its related devices are measured. Although the magnetic field of the LHD is possible to confine the plasma with high efficiency, complete confinement is difficult. Recently health effects of magnetic field become clear but distinctly speaking chronic exposure effects for occupational have not been defined. The major issues are not only static magnetic field but also variable magnetic fields, of which frequencies are from extremely low frequency (ELF) of 50-60 Hz to high frequency of 100 GHz. At the magnetic fusion facilities, many type of electric and magnetic fields generating devices are equipped. Except the super conducting coil system, a motor-generator power supply system, microwave generator to clean the plasma facing walls, and plasma heating devices like ICRF (Ion cyclotron range frequency) and ECH (Electron cyclotron resonance heating) are used. Acute biological effect of high frequency electromagnetic fields (EMF) is based on thermal absorbing effect. Almost all the electromagnetic waves are absorbed by construction materials of the devices, but there exist more or less leakage of EMF. So safety of occupational EMF exposure was discussed considering the LHD and related devices.

### Static magnetic field:

Static magnetic flux density was measured with a gauss meter in the LHD device room and outside of 2 m concrete wall for radiation shield. In case of 1.5 T plasma operation, magnetic field is 70 mT near the

cryostat, and outside of the radiation shield wall is 0.05 mT. The measured magnetic flux density at radius direction are almost agree with calculation as shown in Fig. 1.

### Extremely low frequency EMF:

The maximum magnetic strength was observed on the upper floor of the motor generator. It was observed as about 0.1 mT. High field values are detected in front of some electric power supplying boards. All these values are less than regulation levels for occupational, which are proposed by ICNIRP (International Conference for Non-Ionizing Radiation Protection). Although, large EMF are not observed in the present survey, proper guide lines should be proposed for occupational safety.

### High frequency EMF:

Monitoring was made with commercially available monitors in frequency range from 100 MHz to 3 GHz. Then it was confirmed that these monitors are useful to detect the registration levels, but their sensitivities are not enough to measure the public exposure levels. Combination of antenna and spectrum analyzer are indispensable for sensitive measurements. Metrics above 30 GHz is the future problems.

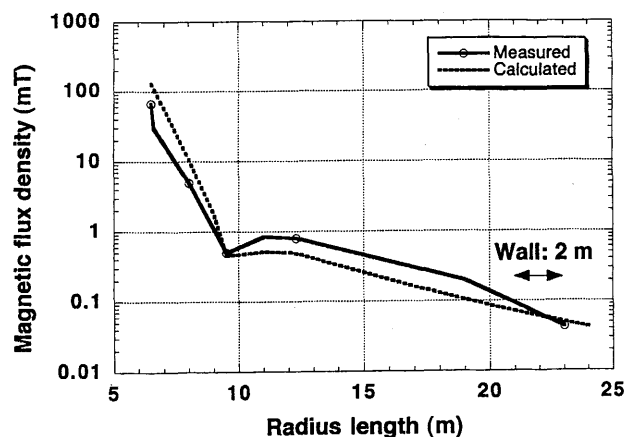


Fig. 1 Relationship of radius length from LHD and static magnetic field. (1.5 T, o-mode)