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**Assessment and management of compliance
with radio frequency electromagnetic field
exposure limits for workers at
radiocommunication sites and facilities**

Recommendation ITU-T K.145

ITU-T

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Assessment and management of compliance with radio frequency electromagnetic field exposure limits for workers at radiocommunication sites and facilities

Summary

Recommendation ITU-T K.145 includes guidance on the protection of workers against radio frequency electromagnetic fields (RF-EMFs) exposure in their working environments. Radio frequency (RF) workers range from installation engineers and tower climbers to R&D personnel and laboratory testing engineers. All of these RF workers are exposed to stronger RF-EMF fields than the general public. There are also RF informed workers who have been provided with information on RF-EMF safe working practices for a site as well as all other workers who are regarded as members of the public for the purposes of RF-EMF exposure limits. This Recommendation provides minimum general safety guidance for telecommunication RF workers around the world.

History

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

Standards or guidelines limiting human exposure to radiofrequency electromagnetic fields (RF-EMFs) have been developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Institute of Electrical and Electronics Engineers (IEEE), or in national regulations. In general, these provide different limits for uncontrolled environments (general public) and controlled environments (occupational). Workers are allowed in areas where the RF-EMF exposure levels are higher than the public limits and below the occupational limits provided they are in a controlled work environment, the workers are appropriately trained and informed of the RF-EMF levels, and they follow approved RF-EMF safe working practices.

This Recommendation provides guidance on the assessment and management of compliance with RF-EMF exposure limits for workers at radiocommunication sites and facilities or where such facilities are located at another site (for example, rooftop antenna installation on non-telecommunication building).

Access controls should be in place to ensure that members of the public, which includes workers that have not received information on approved RF-EMF safe working procedures, cannot access areas above the public RF-EMF limits.

Recommendation ITU-T K.145

Assessment and management of compliance with radio frequency electromagnetic field exposure limits for workers at radiocommunication sites and facilities

1 Scope

This Recommendation identifies three groups of workers: radiofrequency (RF) workers (for whom RF-EMF exposure is intrinsic to the nature of their work); informed workers (who have been provided with information on RF-EMF safe working practices for a site) and all other workers who are regarded as members of the public for the purposes on RF-EMF exposure limits. It provides guidance on the management of situations where RF workers and informed workers can be exposed under controlled/occupational exposure conditions at levels higher than general population/uncontrolled exposure limits. Reference is made to the difference between general public and occupational limit levels. Good practices are described for workers and employers, including workers, such as pregnant women, and workers with implanted or external medical devices, that can be active or non-active (passive), for whom other limits may apply.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T K.52] Recommendation ITU-T K.52 (2018), *Guidance on complying with limits for human exposure to electromagnetic fields*.
- [ITU-T K.61] Recommendation ITU-T K.61 (2018), *Guidance to measurement and numerical prediction of electromagnetic fields for compliance with human exposure limits for telecommunication installations*.
- [ITU-T K.70] Recommendation ITU-T K.70 (2020), *Mitigation techniques to limit human exposure to EMFs in the vicinity of radiocommunication stations*.
- [ITU-T K.83] Recommendation ITU-T K.83 (2020), *Monitoring of electromagnetic field levels*.
- [ITU-T K.91] Recommendation ITU-T K.91 (2020), *Guidance for assessment, evaluation and monitoring of human exposure to radio frequency electromagnetic fields*.
- [ITU-T K.122] Recommendation ITU-T K.122 (2016), *Exposure levels in close proximity of radiocommunication antennas*.
- [ITU-R BS.1698] Recommendation ITU-R BS.1698 (2005), *Evaluating fields from terrestrial broadcasting transmitting systems operating in any frequency band for assessing exposure to non-ionizing radiation*.
- [IEC/EN 62232] IEC 62232:2017, *Determination of RF field strength, power density and SAR in the vicinity of radiocommunication base stations for the purpose of evaluating human exposure*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 antenna [ITU-T K.70]: Device that serves as a transducer between a guided wave (e.g., coaxial cable) and a free space wave, or vice versa. It can be used to emit or receive a radio signal. In this Recommendation the term antenna is used only for emitting antenna(s).

3.1.2 averaging time (T_{avg}) [ITU-T K.83]: Appropriate time over which exposure is averaged for purposes of determining compliance with the limits.

3.1.3 basic restrictions: Restrictions on exposure to time-varying electric, magnetic and electromagnetic fields that are based directly on established health effects. Depending upon the frequency of the field, the physical quantities used to specify these restrictions are: current density (J), specific absorption rate (SAR) and power density (S).

3.1.4 controlled/occupational exposure [ITU-T K.70]: Controlled/occupational exposure applies to situations where the persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Controlled/occupational exposure also applies to the cases where the exposure is of transient nature as a result of incidental passage through a location where the exposure limits may be above the general population/uncontrolled environment limits, as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

3.1.5 electric field strength (E) [ITU-T K.83]: Magnitude of a field vector at a point that represents the force (F) on a small test charge (q) divided by the charge:

$$E = \frac{F}{q}$$

The electric field strength is expressed in units of volt per metre (V/m).

3.1.6 electromagnetic field (EMF) [ITU-T K.91]: A field determined by a set of four interrelated vector quantities that characterizes, together with the electric current density and the volumic electric charge, the electric and magnetic conditions of a material medium or of a vacuum.

3.1.7 exposure [ITU-T K.83]: Exposure occurs whenever a person is exposed to electric, magnetic or electromagnetic fields.

3.1.8 exposure level: Value given in the appropriate quantity used when to express the degree of exposure of a person to electromagnetic fields or contact currents.

3.1.9 exposure limits: Values of the basic restrictions or reference levels acknowledged, according to obligatory regulations, as the limits for the permissible maximum level of the human exposure to the electromagnetic fields.

3.1.10 far-field region [ITU-T K.83]: Region of the field of an antenna where the radial field distribution is essentially dependent inversely on the distance from the antenna. In this region, the field has a predominantly plane-wave character, i.e., locally uniform distribution of electric field and magnetic field in planes transverse to the direction of propagation.