

# EMF EXPOSURE GUIDELINES AND POLICIES

## THE PRESENT SITUATION

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### WHO DECIDES ON GUIDELINES?

Countries set their own national standards for exposure to electromagnetic fields. However, the majority of national standards are based on the guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This non-governmental organization, formally recognized by WHO, evaluates scientific results from all over the world. ICNIRP produces guidelines recommending limits of exposure, which are reviewed periodically and updated as necessary.

### WHAT ARE GUIDELINES BASED ON?

ICNIRP guidelines developed for EMF exposure cover the non-ionizing radiation frequency range

from 0 to 300 GHz. They are based on comprehensive reviews of all the published peer-reviewed literature. Exposure limits are based on effects related to *short-term* acute exposure rather than *long-term* exposure, because the available scientific information on the long-term low level effects of exposure to EMF fields is considered to be insufficient to establish quantitative limits.

Using short-term acute effects, international guidelines use the approximate exposure level, or *threshold level*, that could potentially lead to

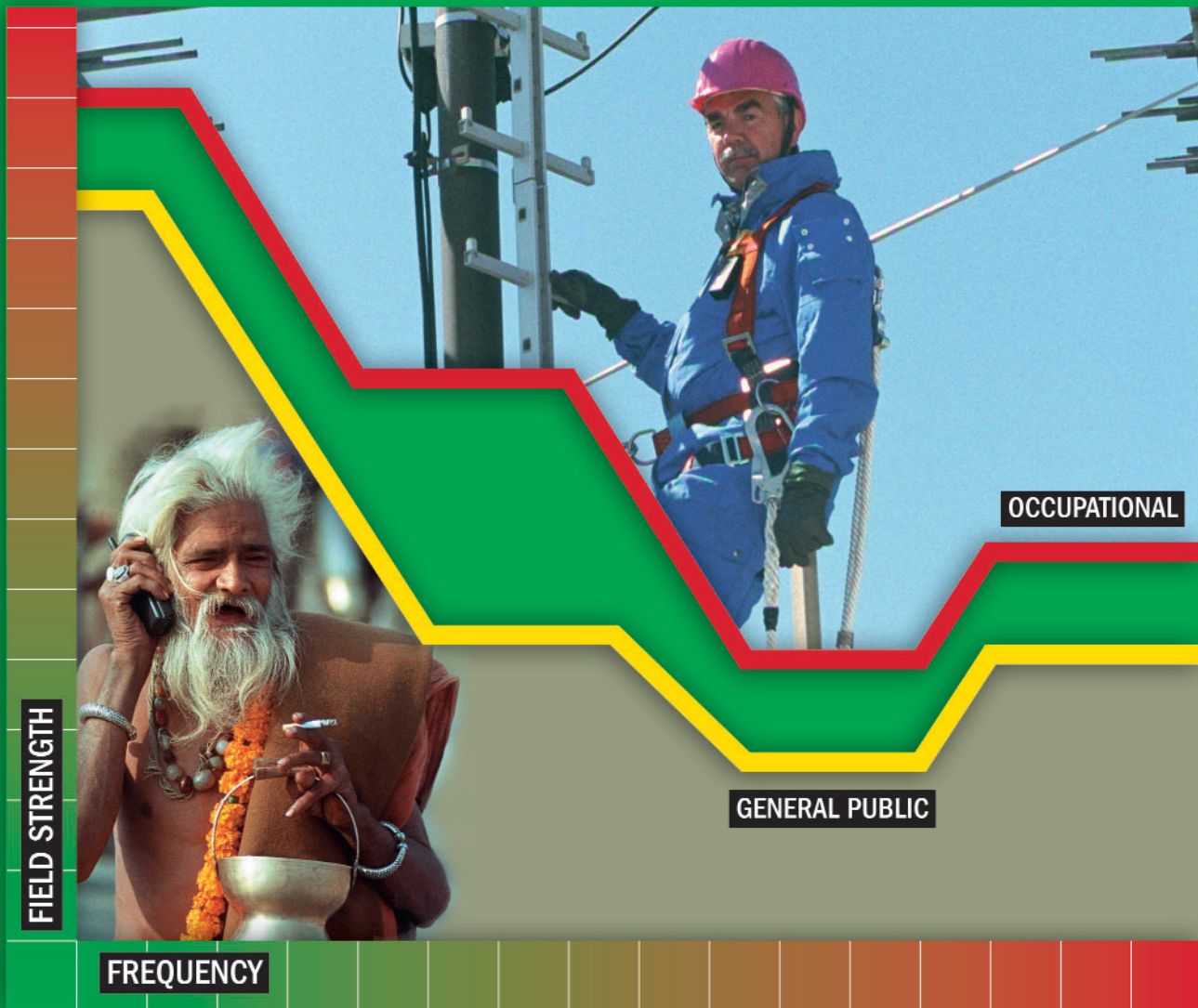


FIGURE 9. ICNIRP GUIDELINES FOR OCCUPATIONAL AND GENERAL PUBLIC EXPOSURE LIMITS

adverse biological effects. To allow for uncertainties in science, this lowest threshold level is reduced further to derive limit values for human exposure. For example, ICNIRP uses a reduction factor of 10 to derive occupational limits for workers and a factor of about 50 to arrive at exposure limits for the general public. The limits vary with frequency, and are therefore different for low frequency fields, e.g. power lines, and high frequency fields, e.g. mobile phones (Figure 9).

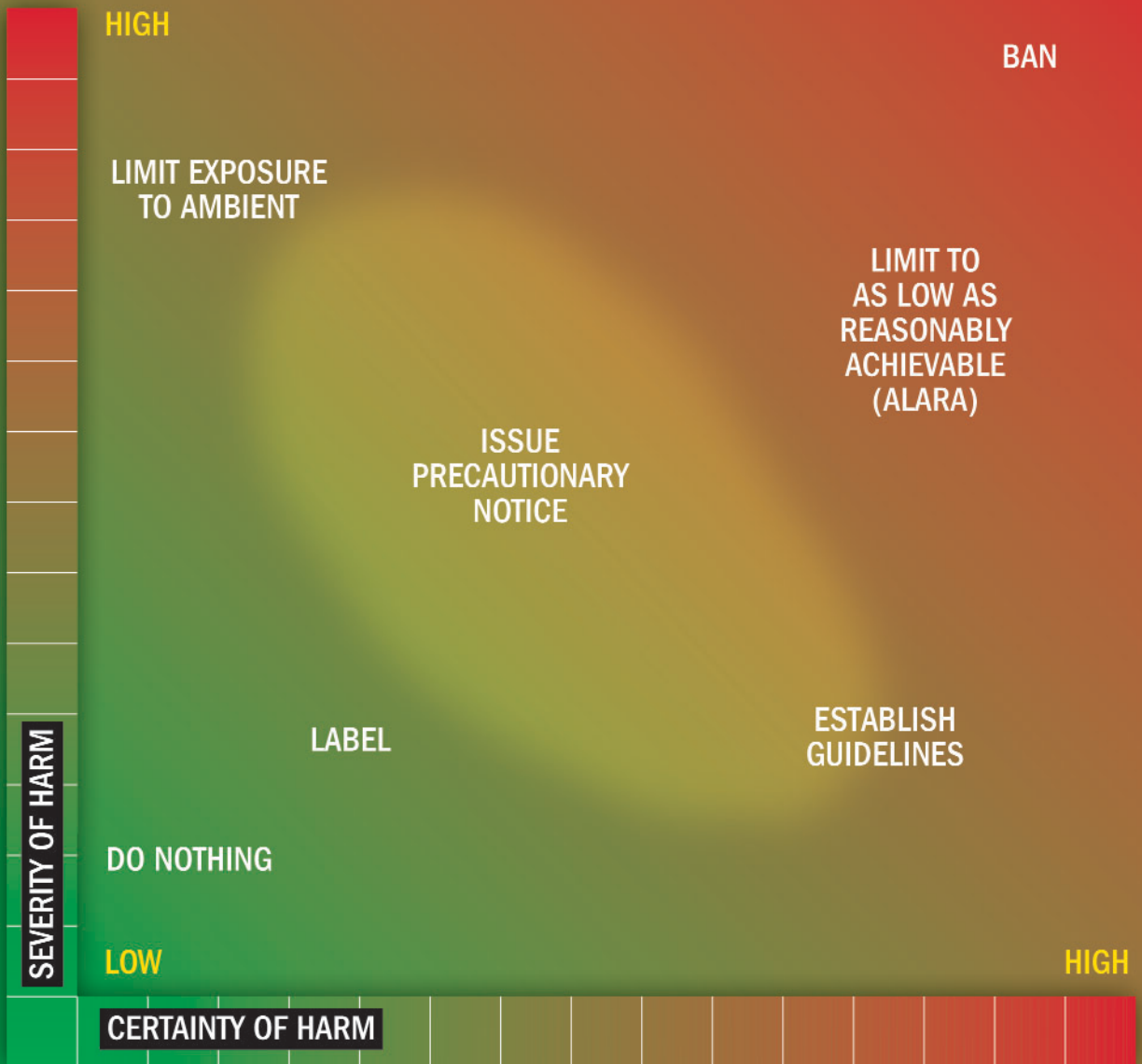
**WHY IS A HIGHER REDUCTION FACTOR APPLIED FOR GENERAL PUBLIC EXPOSURE GUIDELINES?**

The occupationally exposed population consists of adult workers who are generally aware of electromagnetic fields and their effects. Workers are trained to be aware of potential risk and to take appropriate precautions. By contrast, the general public consists of individuals of all ages and of varying health status who, in many cases,

are unaware of their exposure to EMF. In addition, workers are typically exposed only during the working day (usually 8 hours per day) while the general public can be exposed for up to 24 hours per day. These are the underlying considerations that lead to more stringent exposure restrictions for the general public than for the occupationally exposed population (Figure 9).

**PRESENT EXPOSURE GUIDELINES**

- In general, standards for low frequency electromagnetic fields are set to avoid adverse health effects due to induced electric currents within the body, while standards for radiofrequency fields prevent health effects caused by localised or whole body heating
- Maximum exposure levels in everyday life are typically below guideline limits
- Exposure guidelines are not intended to protect against electromagnetic interference (EMI) with electromedical devices. New industry standards are being developed to avoid such interference



**FIGURE 10. RANGE OF ACTIONS UNDER UNCERTAINTY**

(adapted from *The precautionary principle and EMF: implementation and evaluation*, Kheifets L. et al., *Journal of Risk Research* 4(2), 113-125, 2001).

## PRECAUTIONARY APPROACHES AND THE PRECAUTIONARY PRINCIPLE

Throughout the world there has been a growing movement inside and outside of government to adopt “precautionary approaches” for management of health risks in the face of scientific uncertainty. The range of actions taken depends on the severity of harm and the degree of uncertainty surrounding the issue. When the harm associated with a risk is small and its occurrence uncertain, it makes sense to do little, if anything. Conversely, when the potential harm is great and there is little uncertainty about its occurrence, significant action, such as a ban, is called for (Figure 10).

*The Precautionary Principle* is usually applied when there is a high degree of scientific uncertainty and there is a need to take action for a potentially serious risk without awaiting the results of more scientific research. It was

defined in the Treaty of Maastricht as “taking prudent action when there is sufficient scientific evidence (but not necessarily absolute proof) that inaction could lead to harm and where action can be justified on reasonable judgements of cost-effectiveness”.

There have been many different interpretations and applications of the precautionary principle. In 2000 the European Commission defined several rules for the application of this principle (see Box, page 56), including cost-benefit analyses.

## SCIENCE-BASED AND PRECAUTIONARY APPROACHES FOR EMF

*Science-based* evaluations of the potential hazards from EMF exposure form the basis of risk assessment and are also an essential part of an appropriate public policy response. The recommendations of ICNIRP guidelines follow rigorous scientific reviews of relevant published scientific papers including those in

<p><b>THE PRECAUTIONARY PRINCIPLE EUROPEAN COMMISSION (2000)</b></p> <p>Where action is deemed necessary, measures based on the precautionary principle should be:</p> <ul style="list-style-type: none"> <li>■ <i>proportional</i> to the chosen level of protection,</li> <li>■ <i>non-discriminatory</i> in their application,</li> <li>■ <i>consistent</i> with similar measures already taken,</li> <li>■ <i>based on an examination of the potential benefits and costs of action or lack of action</i> (including where appropriate and feasible, an economic cost/benefit analysis),</li> <li>■ <i>subject of review</i>, in the light of new scientific data, and</li> <li>■ <i>capable of assigning responsibility for producing the scientific evidence necessary for a more comprehensive risk assessment.</i></li> </ul>	<p>assumptions made about the efficiency with which EMFs interact with people.</p> <p><i>Precautionary approaches</i>, such as the Precautionary Principle, address additional uncertainties as to possible but unproven adverse health effects. Such risk management policies provide an opportunity to take incremental steps with respect to emerging issues. They should include cost-benefit considerations and should be seen as an addition to, and not as a substitute for, science-based approaches in assisting decision-makers to develop public policy.</p> <p>In the context of the EMF issue, some national and local governments have adopted “<i>prudent avoidance</i>”, a variant of the precautionary principle, as a policy option. It was originally used for ELF fields and is described as using simple, easily achievable, low to modest (prudent) cost measures to</p>
<p>the fields of medicine, epidemiology, biology and dosimetry. Science-based judgements on exposure levels that will prevent identified adverse health effects are then made. Here, caution is exercised both in respect of the magnitude of reduction factors (based on uncertainties in the scientific data and on possible differences in susceptibility of certain groups) and in the conservative</p>	

reduce individual or public EMF exposure, even in the absence of certainty that the measures would reduce risk.

The explicit recognition that a risk may not exist is a key element of precautionary approaches. If the scientific community concludes that there is no risk from EMF exposure or that the possibility of a risk is too speculative, then the appropriate response to public concern should be an effective education programme. If a risk for EMF were to be established, it would then be appropriate to rely on the scientific community to recommend specific protective measures using established public health risk assessment/risk management criteria. If large uncertainties remain, then more research will be needed.

If regulatory authorities react to public pressure by introducing precautionary limits

in addition to the already existing science-based limits, they should be aware that this undermines the credibility of the science and the exposure limits.

### **WHAT IS THE WORLD HEALTH ORGANIZATION DOING?**

In response to growing public concern over possible adverse health effects from exposure to a rising number and diversity of EMF sources, the World Health Organization (WHO) launched the *International EMF Project* in 1996. All health risk assessments will be completed by 2006.

The International EMF Project brings together current knowledge and available resources of key international and national agencies and scientific institutions in order to assess health and environmental effects of exposure to static and time varying electric and magnetic fields in the frequency range 0 -



## KEY OBJECTIVES WHO INTERNATIONAL EMF PROJECT

1. Provide a coordinated international response to concerns about possible health effects of exposure to EMF,
2. Assess the scientific literature and makes status reports on health effects,
3. Identify gaps in knowledge needing further research to make better health risk assessments,
4. Encourage focused, high quality research programmes,
5. Incorporate research results into WHO's Environmental Health Criteria monographs where formal health risk assessments will be made of EMF exposure,
6. Facilitate the development of internationally acceptable standards for EMF exposure,
7. Provide information on the management of EMF protection programmes for national and other authorities, including monographs on EMF risk perception, communication and management, and
8. Provide advice to national authorities and others on EMF health and environmental effects and any protective measures or actions needed.

300 GHz. The Project has been designed to follow a logical progression of activities and produce a series of outputs to allow improved health risk assessments to be made and to identify any environmental impacts of EMF exposure.

The Project is administered at the World Health Organization headquarters in Geneva, since it is the only United Nations Organization with a clear mandate to investigate detrimental health effects from exposure of people to non-ionizing radiation.

WHO collaborates with 8 international agencies, over 50 national authorities, and 7 collaborating centres on non-ionizing radiation protection from major national government agencies.

Further details on the EMF Project and results achieved so far are available on the home page at: <http://www.who.int/emf/>.

*International*  
**EMF** *Project*