



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People.™

## EMF (ELECTRIC AND MAGNETIC FIELDS)

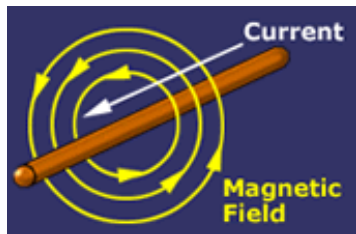
NIOSH research on protecting workers from proven and possible EMF health risks focuses on:

- RF (radio frequencies)—including broadcast antennas, induction heaters, and cell telephones
- ELF (extremely low frequencies)—including AC electricity and video display terminals (VDTs)
- Static Magnetic Fields—including DC electricity.

### CDC/NIOSH Publications on EMF

Manual for Measuring Occupational Electric and Magnetic Field Exposures (<http://www.cdc.gov/niosh/docs/98-154/>)

NIOSH Publication No. 98-154 (1998)




This technical document is a reference manual for industrial hygienists and researchers who measure occupational exposures to static and ELF EMF.

NIOSH Publication on Video Display Terminals (<http://www.cdc.gov/niosh/docs/99-135/>)


NIOSH Publication No. 99-135 (3rd ed., 1999)

This publication is a collection of NIOSH studies and statements on all kinds of health effects from working with VDTs, including studies which found no link between their EMF emissions and reproductive effects.

### RF Fields

OSHA: Radiofrequency/Microwave Radiation (<http://www.osha.gov/SLTC/radiofrequencyradiation/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Information on the recognition, evaluation, and control of RF/MW radiation.

Federal Communications Commission (FCC): Radio Frequency Safety (<http://www.fcc.gov/oet/rfsafety/rf-faqs.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Information and health standards for consumers and broadcasters on wireless communications, including cellular telephones and amateur radios.

Food and Drug Administration (FDA): Radiation-Emitting Products for Home, Business and Entertainment


<http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/default.htm>   
<http://www.cdc.gov/Other/disclaimer.html>

Information for consumers and manufacturers on microwave ovens, video display terminals, cell phones, etc.

**International Agency for Research on Cancer (IARC): Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields**

<http://monographs.iarc.fr/ENG/Monographs/vol102/index.php>  <http://www.cdc.gov/Other/disclaimer.html> .

IARC Monographs, Volume 102 (2013). This highly-respected international program evaluated the carcinogenicity of RF fields, especially cell phones, as part of its program to evaluate all potential carcinogens.


**FDA/FCC: Consumer Update on Mobile Phones** <http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/default.htm>   
<http://www.cdc.gov/Other/disclaimer.html>

FDA site with answers to frequently-asked questions about potential health risks from using mobile telephones and research on this question.

**NIEHS: Cell Phones** <http://www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm>  <http://www.cdc.gov/Other/disclaimer.html>

NIEHS research on possible health risks from cell phones, especially the ongoing animal cancer assay by the National Toxicology Program (NTP).


**National Radiation Protection Board in Great Britain: A Summary of Recent Reports on Mobile Phones and Health (2000-2004)**

[http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1194947376017](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947376017)  <http://www.cdc.gov/Other/disclaimer.html>

NRPB-W65 (2005)

This British report reviews studies of brain cancer and neurological effects from the use of cell phones health and highlights any commonality or differences in opinion.

**National Radiation Protection Board in Great Britain: Health Effects from Radiofrequency Electromagnetic Fields: Report of an independent Advisory Group on Non-ionising Radiation**

[http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1194947334474](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947334474) 

<http://www.cdc.gov/Other/disclaimer.html>

NRPB Documents Volume 14, No. 2 (2003)

This report examines possible health effects of exposure to RF fields, with an emphasis on studies conducted since the report Mobile Phones and Health <http://www.iegmp.org.uk/index.htm>  <http://www.cdc.gov/Other/disclaimer.html> by the Independent Expert Group on Mobile Phones Chair Sir William Stewart (2000). The Stewart report was one of the first government reviews on possible health effects from cell phones. It recommended precautionary measures to protect the public health.

## ELF and Static EMF

Risk Assessment and Risk Management Five major evaluations of the evidence for health risks from exposures to occupational and residential ELF-EMF have been published since 1999. Four of them were accompanied by statements on managing EMF exposures and directions for future research.


- "ELF Electromagnetic Fields and the Risk of Cancer" by the Advisory Group on Non-ionising Radiation of the National


Radiological Protection Board ([http://www.hpa.org.uk/web/HPAwebFile/HPAweb\\_C/1194947420620](http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947420620)) 


(<http://www.cdc.gov/Other/disclaimer.html>)

(now called the Radiation Protection Division of the Health Protection Agency)

NRPB Documents Volume 12, No. 1 (2001)

This British risk evaluation reviews the evidence on cancer risks from residential and occupational ELF-EMF exposures and makes recommendations on policy and further research. The Board of the NRPB issued a Response ([http://www.hpa.org.uk/web/HPAweb%26HPAwebStandard/HPAweb\\_C/1195733708122](http://www.hpa.org.uk/web/HPAweb%26HPAwebStandard/HPAweb_C/1195733708122))  (<http://www.cdc.gov/Other/disclaimer.html>) on its implications for future research and EMF exposure limits.

- Non-ionizing Radiation, Part I: Static and Extremely Low Frequency Electric and Magnetic Fields 



(<http://monographs.iarc.fr/ENG/Monographs/vol80/volume80.pdf>)  (<http://www.cdc.gov/Other/disclaimer.html>)

Monograph by the International Agency for Research on Cancer IARC Monographs, Volume 80 (2002)

This risk assessment is part of a highly-respected international program to evaluate all carcinogens. The complete monograph is available as a PDF file.

- Evaluation of the Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring, Electrical Occupations and Appliances (<http://www.ehib.org/emf/RiskEvaluation/riskeval.html>)  (<http://www.cdc.gov/Other/disclaimer.html>)


(Report from the California EMF Program (2002))

This report by the California Department of Health Services evaluates the evidence for the risks of all diseases from exposures to residential and occupation ELF-EMF, concentrating on more recent studies. It uses a new method of risk assessment, based on the Bayesian philosophy of science. Public comments and criticisms of this report are posted on the same website. The California EMF Program also published Policy Options in the Face of Possible Risk from Power Frequency Electric and Magnetic Fields (EMF)  [PDF - 76 KB] (<http://www.ehib.org/emf/RiskEvaluation/PolicyOptionsF.pdf>)  (<http://www.cdc.gov/Other/disclaimer.html>) which analyzes possible government actions under different regulatory philosophies, including a cost-benefit analysis for power line modifications.

- Extremely Low Frequency Fields - Environmental Health Criteria 238 Monograph from the World Health Organization (2007)

([http://www.who.int/peh-emf/publications/elf\\_ehc/en/index.html](http://www.who.int/peh-emf/publications/elf_ehc/en/index.html))  (<http://www.cdc.gov/Other/disclaimer.html>)

This comprehensive monograph reviews all aspects of ELF-EMF health risks, research and hazard management. It also makes recommendations for occupational health policy, including precautionary measures to deal with the possible cancer risks.

OSHA: Extremely Low Frequency (ELF) Radiation (<http://www.osha.gov/SLTC/elfradiation/index.html>) 

(<http://www.cdc.gov/Other/disclaimer.html>)

Information on the recognition, evaluation, and control of ELF radiation.

OSHA: Computer Workstations (<http://www.osha.gov/SLTC/computerworkstation/index.html>)  (<http://www.cdc.gov/Other/disclaimer.html>)

This page briefly examines the potential hazards and interventions employers can use to prevent or reduce the potential harmful effects of working with computers.

NIOSH Fact Sheet: EMFs in the Workplace (<http://www.cdc.gov/niosh/docs/96-129/>)

NIOSH Publication No. 96-129 (1996)

En Español ([http://www.cdc.gov/spanish/niosh/docs/96-129\\_sp/](http://www.cdc.gov/spanish/niosh/docs/96-129_sp/))

This fact sheet answers frequently-asked questions about extremely low frequency (ELF) EMFs in the workplace. This publication can help identify EMF sources at work and suggests simple steps for reducing exposures.

## EMF Questions and Answers: Electric and Magnetic Fields Associated with the Use of Electric Power

[http://www.niehs.nih.gov/health/assets/docs\\_p\\_z/results\\_of\\_emf\\_research\\_emf\\_questions\\_answers\\_booklet.pdf](http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf) 

<http://www.cdc.gov/Other/disclaimer.html>

National Institute of Environmental Health Sciences publication (2002)

This NIEHS booklet written with input from NIOSH provides in-depth information about ELF-EMF exposures in homes, workplaces, and transportation. It also describes what researchers have learned about the health effects of EMFs and identifies some methods for managing exposures.

## NIOSH Documents on ELF-EMF Research

Manual for Measuring Occupational Electric and Magnetic Field Exposures (<http://www.cdc.gov/niosh/docs/98-154/>)

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## EMF Databases

Job Exposure Matrix (JEM) for Power-Frequency Magnetic Fields (</niosh/topics/emf/jem-powerfreq/jempowerfreq.html>)

This site contains Excel® spreadsheets developed by NIOSH to assess exposures to ELF magnetic fields by occupational categories. By using the 1980 Standard Occupational Classifications (SOC) or the 1980 U.S. Census categories, this JEM can be linked to mortality and morbidity databases for epidemiologic studies (Bowman et al., 2006 (<http://www2a.cdc.gov/nioshtic-2/BuildQyr.asp?s1=20032528&f1=%2A&Startyear=&Adv=0&terms=1&B1=Search&D1=10&Limit=500&Sort=DP+DESC&EndYear=&PageNo=1&RecNo=1&View=f&>)).

EMF RAPID program: EMF Measurement Database (<http://www.emf-data.org/>)  (<http://www.cdc.gov/Other/disclaimer.html>)


This site contains six databases of EMF measurements taken in homes and workplaces. The data is thoroughly annotated and can be downloaded in various forms.

## Worker Notification Program


Through the NIOSH Worker Notification Program (<http://www.cdc.gov/niosh/pgms/worknotify/>), NIOSH notifies workers and other stakeholders about the findings of past research studies related to a wide variety of exposures. The links below present archival materials sent to participants in studies related to EMF from video display terminals.

- Video Display Terminal Operators (Electromagnetic Fields) (<http://www.cdc.gov/niosh/pgms/worknotify/VDTrepro.html>)


## Links to Other EMF Sites


**OSHA: Extremely Low Frequency (ELF) Radiation** (<http://www.osha.gov/SLTC/elfradiation/index.html>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Information on the recognition, evaluation, and control of ELF radiation.

**OSHA: Radiofrequency/Microwave Radiation** (<http://www.osha.gov/SLTC/radiofrequencyradiation/index.html>)   
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**Federal Communications Commission (FCC): Radio Frequency Safety** (<http://www.fcc.gov/oet/rfsafety/rf-faqs.html>)   
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Information and health standards for consumers and broadcasters on wireless communications, including cellular telephones and amateur radios.


**Food and Drug Administration (FDA): Radiation-Emitting Products for Home, Business and Entertainment**  
(<http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/default.htm>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Information for consumers and manufacturers on microwave ovens, video display terminals, etc.


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(<http://www.cdc.gov/Other/disclaimer.html>)


FDA site with information about potential health risks from using mobile telephones and research on this question.

**FDA: MRI (Magnetic Resonance Imaging)** (<http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm200086.htm>)  (<http://www.cdc.gov/Other/disclaimer.html>)  
Information for consumers and professionals on benefits, risks and safety measures with MRIs.

**National Institute of Environmental Health Sciences** (<http://www.niehs.nih.gov/health/topics/agents/emf/>)   
(<http://www.cdc.gov/Other/disclaimer.html>):

Electric and Magnetic Fields Information on possible health risks from ELF EMF and links to NIEHS publications.

**NIEHS: Cell Phones** (<http://www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm>)  (<http://www.cdc.gov/Other/disclaimer.html>)  
NIEHS research on possible health risks from cell phones, especially the ongoing animal cancer assay by the National Toxicology Program (NTP).

**Health Protection Agency in Great Britain: Electromagnetic Fields**  
(<http://www.hpa.org.uk/webw/HPAweb%26Page%26HPAwebAutoListName/Page/1158934607698?p=1158934607698>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Information, research publications, and the United Kingdom's health standards on many sources of RF and ELF electromagnetic fields: cordless phones, cell phones, wireless local area networks (WLANs), WiFi networks, electric substations, power lines, and amateur radios.

World Health Organization (WHO): International EMF Project (<http://www.who.int/peh-emf/en/>)   
(<http://www.cdc.gov/Other/disclaimer.html>)

Provides a collection of fact sheets and other resources concerning health effects of exposure to RF and ELF electromagnetic fields.

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