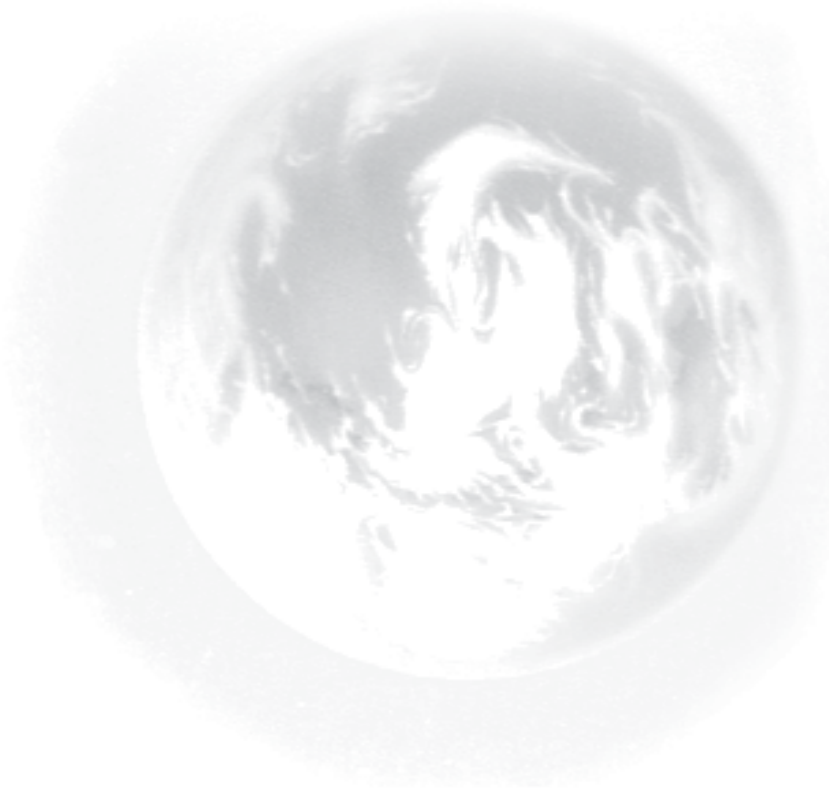
Electricity Authority of Cyprus | Energy for life!

Electromagnetic Fields

Answers to your questions



Introduction

A number of epidemiological studies that have been carried out in recent years have speculated about the existence of a direct relationship between electromagnetic fields and health problems. However, no study to date has succeeded in proving such a relationship.

The subject has been studied by teams of scientists in a variety of specialist areas from many international organizations and all have concluded that, based on the epidemiological studies and experimental evidence obtained so far, there is no serious evidence to link 50-60Hz electromagnetic fields with any disease.

By providing the following information, EAC wishes to report on what is actually known to date and to place the subject in its true context, so as to avoid wrong impressions and unjustified concerns on the part of the public.

What are Electric and Magnetic Fields?

An electric field is generated by the pressure (voltage), or the electrical force caused by the flow of electricity through a conductor (device, line, cable). This field has a unit of measure volt per metre (V/m).

A magnetic field is generated by the intensity of the electric current as it flows through the conductor. This field is measured in Teslas (T) or fractions of Tesla, such as a microtesla (μT) which is a million times smaller than a Tesla.

An electric field increases in intensity according to the voltage that generates it and a magnetic field grows in size as the current increases.

What are Electromagnetic Fields?

Electricity flowing through a conductor generates two fields: an electric field and a magnetic field.

Electromagnetic fields are generated by power lines (Transmission & Distribution) and by any other electricity conductor, electric machine or electrical appliance, such as a hair dryer, a house's wiring system, a computer, etc.

Electromagnetic fields are also generated by radio and television transmission masts and by mobile telephony masts. These fields are high frequency (up to 300 GHz) and have different properties from the low frequency (50-60 Hz) fields created by the electrical systems operated by power companies such as EAC.

Another electromagnetic field, which exists everywhere, is the one created by the Earth's natural magnetism (Earth's magnetic field) and other natural phenomena.

The size of the magnetic field on the Earth's surface depends on the geographical latitude and varies between 30 mT and 70 mT approximately.

The Earth's electric field is about 120 V/m close to the surface. The intensity of the electric field is affected by weather conditions and other natural phenomena.

Electromagnetic fields cannot be seen or felt but they can be measured with the use of special equipment. Their size depends on the magnitute of voltage or intensity of the electric current flowing through the conductor.

Electromagnetic fields are substantially reduced, at a fast rate, by moving away from the source that generates them (increasing or descreasing depending on the distance from the source that generates them).

Where do electromagnetic fields exist?

Electromagnetic fields exist everywhere in nature and usually comprise a mixture of fields such as the Earth's electric and magnetic fields together with those generated wherever electricity is used. They exist in every house that uses electrical appliances, close to power lines, near radio and television station masts, mobile telephony masts and similar installations.

The magnetic fields generated by some domestic electrical appliances are much larger than those generated by power lines, as shown in the table below.

Magnetic fields in the proximity of various domestic appliances

DOMESTIC APPLIANCE	SIZE OF MAGNETIC FIELD (μT) AT DIFFERENT DISTANCES		
	3 cm	30 cm	1 m
Hair dryer	6 - 2000	less than 0,01 - 7	less than 0,01 - 0,3
Electric shaver	15 - 1500	0,08 - 9	less than 0,01 - 0,3
Electric saw	250 - 1000	1 - 25	0,01 - 1
Electric Drill	400 - 800	2 - 3,5	0,08 - 0,2
Vacuum cleaner	200 - 800	2 - 20	0,13 - 2
Mixer	60 - 700	0,6 - 10	0,02 - 0,25
Fluorescent desk lamp	40 - 400	0,5 - 2	0,02 - 0,25
Microwave oven	75 - 200	4 - 8	0,25 - 0,6
Fluorescent light	15 - 200	0,2 - 4	0,01 - 0,03
Electric cooker plate	6 - 200	0,35 - 4	0,01 - 0,1
Television	2,5 - 50	0,04 - 2	less than 0,01 - 0,15
Electric oven	1 - 50	0,15 - 0,5	0,01 - 0,04
Washing machine	0,8 - 50	0,15 - 3	0,01 - 0,15
Electric iron	8 - 30	0,12 - 0,3	0,01 - 0,25
Fan – Blower	2 - 30	0,03 - 4	0,01 - 0,35
Dishwasher	3,5 - 20	0,6 - 3	0,07 - 0,3
Refrigerator	0,5 - 1,7	0,01 - 0,25	less than 0,01

TYPICAL FIELD FOR A DOMESTIC ENVIRONMENT: 0,01 - 0,2 μT
FIELD DIRECTLY BENEATH OVERHEAD 132 kV POWER LINES IN CYPRUS: 0,5 - 7 μT
ACCEPTED LIMIT FOR CONTINUOUS HUMAN EXPOSURE TO 50 Hz MAGNETIC FIELD: 100 μT
The above limit, concerning the 50Hz frequency on which the EAC's systems operate, was set by the Council of Europe.

Conclusions of International Organizations

"Based on the epidemiological studies and laboratory research carried out so far, there is no definitive evidence associating electromagnetic fields with any disease."

In summary, this is the scientists' conclusion on the subject, as announced at the end of a meeting of the three most authoritative and internationally renowned organizations – the Edison Electric Institute (EEI) of the USA, the Federation of Electric Power Companies of Japan (FEPC) and the International Union of Producers and Distributors of Electrical Energy (UNIPEDE) – which was held in Washington on May 11-12, 1993. The above statement was reaffirmed by the three organizations in May 1994.

Other prestigious international organizations argue:

"There is no persuasive biological evidence to show that low level low-frequency electromagnetic fields can influence any of the accepted stages in carcinogenesis"

Documents of NRPB, Vol.5, No.2, 1994
(National Radiological Protection Board, UK)

"A detailed review of the studies on the possible biological effects of electromagnetic fields has failed to confirm them as a cause of cancer. The review... examined 245 papers recently published around the world but found no evidence to justify the high level of media speculation concerning the possible harmful effects of low-frequency electromagnetic fields or the needless public concern it generates."

Institution of Electrical Engineers,
UK (Review 1994)

"The scientific literature and the reports of reviews by other panels show no consistent, significant link between cancer and power line fields... No plausible biophysical mechanisms for the systematic initiation or promotion of cancer by these power line fields have been identified. Furthermore, the preponderance of the epidemiological and biophysical/biological research findings have failed to substantiate those studies which have reported specific adverse health effects from exposure to such fields."

American Physical Society Washington
(Council Statement 1995)

"The conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human health hazard" and "Specifically, no conclusive or consistent evidence shows that exposures to residential electric or magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects."

U.S. Academy of Sciences
(Report 1996)

"Electromagnetic fields have not been shown to cause cancer. In fact, no non-ionizing radiation has been shown to cause cancer or to promote its growth once it has started."

American Cancer Society
(Document 002689, 1997)

"The results of the research... provide substantial evidence that there is not a robust biological effect of EMF exposure at environmentally relevant levels. These data when taken together with the National Academy of Sciences report provide a basis for concluding that environmental EMF exposures at the levels to which human exposure occurs in the environment do not demonstrate an effect on critical biological processes and functions that could be expected to adversely affect human health..."

National Institute of Environmental Health Sciences (NIEHS),
USA (From the summary of the of the results of research supported by the NIEHS, December 14, 1998)

The NIEHS places the possible danger from low frequency electromagnetic fields **in the same category as coffee, vehicle exhaust fumes, saccharin, etc.,** based on the evaluations of carcinogenic factors of the International Agency for Research on Cancer (IARC).

"There is no proven link between EMFs and childhood or adult cancer and no additional scientific evidence which would call for a change in exposure guidelines."

National Radiological Protection Board,
UK (NRPB Report on Electromagnetic fields and the Risk of Cancer, 2001)

The above conclusion was also reached by the Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) of the European Commission, following the relevant directive of the Directorate General, Health and Consumer Protection of the European Commission.

Directorate General, Health and Consumer Protection

EAC action

The EAC has an extremely well-informed technical staff, members of which are continuously monitoring and being briefed on the latest developments through official organizations, specialist publications and their own studies that are published from time to time. The EAC assures the public that it has adopted and complies with the accepted limits on electromagnetic field exposure that have been set by internationally approved organizations **as a preventative measure**, and that it will take any measures that may be decided by such organizations in the future. Cyprus is a relatively small country and does not possess the necessary mechanisms to take its own decisions on such an issue concerning human health.

The EAC has acquired special equipment and carries out measurements of Electric and Magnetic fields created by power lines. The results of these measurements so far have shown that the strength of the fields is extremely low compared with the maximum acceptable limits set by international organizations such as the World Health Organization WHO), the International Radiation Protection Association (IRPA) and the European Committee for Electrotechnical Standardization (CENELEC).

Exposure limits for electromagnetic fields

The Electricity Authority has adopted fully all the relevant recommendations and directives of the European Union which determine the strictest limits among those of the above mentioned international organizations.

Concerning exposure to electromagnetic fields, the population can be divided into two categories: the general population and the working population.

Regarding the general population, the Electricity Authority has adopted fully and complies with the Recommendation of the European Council 1999/519/EC of July 12, 1999 on the limitation of exposure of the general public to electromagnetic fields (0Hz-300GHz). On the basis of this recommendation, the acceptable limit for the 50Hz frequency on which the Electricity Authority's network operates is 100μT for the magnetic field and 5,000V/m for the electric field.

Regarding the working population, the Electricity Authority has adopted fully and complies with the Directive 2004/40/EC of the European Parliament and Council of April 29, 2004 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields). On the basis of this Directive, the limit applicable to the 50Hz frequency is 500μT for the magnetic field and 10,000V/m for the electric field.

The average magnetic field that is created directly beneath the Authority's 132 kV power lines fluctuates between 0.5μT and 7μT. In other words, it is between 14 and 200 times lower than the 100mT limit set by the European Council. It is very important to state that magnetic fields of this size exist inside every household, office, etc. The average electric field fluctuates between 40V/m and 1,000V/m, i.e. 5 to 125 times lower than the Council of Europe's 5,000V/m limit.

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