

Expert Committee on Health Risk Analysis of Electromagnetic Fields (Phase III)

Electromagnetic Environment Technology Committee

1. Objective

The Institute of Electrical Engineers of Japan (IEEJ) is on a mission to conduct research and evaluation activities from a neutral and impartial perspective on "problems related to the effects of electromagnetic fields on human health," which are of great interest to society, as well as broaden the understanding of society in general and ensure the dissemination of accurate information on this topic. Consequently, the "Special Committee on the Investigation of Biological Effects of Electromagnetic Fields" was established, from December 1995 to March 2012, under the direct supervision of the Chairman, to conduct active investigations and research.

However, it has been pointed out that organization is necessary for the IEEJ to continue to address the biological effects of electromagnetic fields, while considering the progress of novel technologies. Therefore, the activities of this committee will be succeeded by the Electromagnetic Environment Technology Committee, under the auspices of the Fundamentals, Materials, and Common Technology Division, which is also currently conducting research on electromagnetic fields and living organisms. In 2013, considering the activities of the above special committee, the "Expert Committee on Health Risk Analysis of Electromagnetic Fields" was established to primarily conduct surveys and research on trends related to uncertain health risk assessment research and risk management policies. In addition, because it is necessary for the IEEJ to have an organization that can consistently respond to this issue, we have not changed the name of the Technical Committee on Surveys, but have conducted surveys on research trends related to health risks, focusing on extremely-low- and intermediate-frequency magnetic fields, from July 2013 to June 2016 and June 2017 to May 2020 as Phases I and II, respectively. In Phase II, we conducted surveys on research trends related to health risks, focusing on extremely-low- and intermediate-frequency magnetic fields, to consolidate knowledge and disseminate information.

Because we are yet to reach a social consensus on the biological effects of electromagnetic fields, it is necessary for us to continue our research activities. Accordingly, the "Expert Committee on Health Risk Analysis of Electromagnetic Fields (Phase III)" will be newly established under the auspices of the Electromagnetic Environment Technology Committee. In Phase III, the committee will continue to monitor research trends on the biological effects of electromagnetic fields, specifically on extremely-low- and intermediate-frequency electromagnetic fields. In addition, we will conduct more in-depth research on the trend of health risk assessment for high-frequency electromagnetic fields, which is currently being studied by the World Health Organization (WHO), based on the fact that devices and products that use high frequencies will become widespread in the future.

Regarding the guidelines and the evaluation method for human exposure, other investigation technical committees, including the Electromagnetic Environment Technical Committee and the National Committee on the Electrotechnical Commission TC106 will play several roles, and we will closely cooperate with them in their activities.

2. Internal and external research activities

Internationally, the WHO launched the "International Electromagnetic Field Project" in 1996 to assess the health risks of electromagnetic field exposure. In 2007, they published "Environmental Health Criteria (EHC) No. 238," which summarizes the health risk assessment of extremely-low- and intermediate-frequency electromagnetic fields up to 100 kHz, and published their official opinion as "Fact Sheet No. 322." In this document, the adoption of international guidelines based on scientific evidence was recommended as a guide

for limiting the exposure of electromagnetic fields to the human body. In addition, health risk assessments of intermediate- and high-frequency electromagnetic fields of 100 kHz or more are being promoted.

Together with these developments, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) has issued international guidelines on protecting humans from electromagnetic fields, and has published four guidelines for electromagnetic fields from 0 to 300 GHz, one for each frequency band. Recently, the "Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz–300 GHz)" was published in 2020, and its ripple effects need to be evaluated in the future. In addition, studies related to electromagnetic field protection at low frequencies (above 0 Hz and up to 100 kHz) have been published to fill in knowledge gaps, and further work is currently underway to revise existing guidelines.

Regarding the trend of risk management in electromagnetic fields, the European Union (EU) enacted the "Directive on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (2013/35/EU)" in 2013, which is reflected in the measures adopted by each country. In Japan, there has been limited developments in the management of health risks from electromagnetic fields in the work environment; an investigation on the efforts made in Europe will be required for future preparedness.

Furthermore, in Japan, following the recommendations made by the "Working Group on Electromagnetic Field Countermeasures for Electric Power Facilities" of the Ministry of Economy, Trade and Industry (METI) in 2008, certain measures have been adopted, such as the establishment of the "Electromagnetic Field Information Center" in July 2008 to promote electromagnetic field risk communication, the magnetic field regulations for electric power facilities in March 2011, and the measures for ground electric facilities of railroads by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in August 2012.

On one hand, studies on electromagnetic fields, including extremely low-frequency magnetic fields, are progressing, and novel ideas are being accumulated. On the other hand, with the widespread use of induction cookers that utilize intermediate-frequency electromagnetic fields, the development of technology for wireless power transmission systems (WPT) with intermediate and high frequency electromagnetic fields, and the rapid development of Internet-connected IoT home appliances, it is becoming necessary to address the issue of biological effects not only in terms of power frequencies and frequencies used in individual technologies, but also in terms of the complex electromagnetic environment.

As a two-phase activity of the Expert Committee on Health Risk Analysis of Electromagnetic Fields, the committee has reviewed research reports, particularly those regarding very-low- and intermediate-frequency magnetic fields, and has independently investigated and evaluated research trends in risk management policies, electromagnetic hypersensitivity, and other frequency bands. Accordingly, they concluded that "no new knowledge sufficient to change the previous health risk assessment has been obtained." The results of this study were presented at the National Conference Symposium. In addition, the results of this survey were reported at the National Convention Symposium and compiled as a technical report; however, a considerable number of studies are still being conducted, especially on low frequencies, and it is necessary to continue these evaluations.

It should be noted that a series of investigative committees of the Electromagnetic Environment Technology Committee, such as the "Expert Committee to Investigate Trends in Evaluation Technology Related to Human Protection from Electromagnetic Fields," have focused on application methods and issues concerning inductive dose evaluation methods and the electromagnetic field measurement technology, as well as human body protection guidelines and their conformity assessment, and not on the basis of health risks themselves. In addition, the Magnetics Technology Committee has a series of special research committees, such as the "Special Research Committee for Applied Research on Magnetic Fields and Materials in Biotechnology, Medicine, and Industry-Academia-Government Collaboration," which focus on research trends in the applied aspects of electromagnetic fields. The objective of these committees is to conduct research on the benefits of the application of magnetic medicine to living organisms; however, they do not target the health risks themselves.

3. Investigative matters

Considering the aforementioned trends, this technical committee will investigate and study the current status, trends, and future issues regarding the following items.

- (1) Biological effects of 50/60 Hz electromagnetic fields generated by electric power equipment and home appliances
 - 1) Epidemiology, 2) Human volunteer experiments, 3) Animal experiments, 4) Cell experiments
- (2) Biological effects of mid-, high-, and ultra-high-frequency electromagnetic fields (300 Hz–10 THz) used in WPT, sensing, etc.
 - 1) Epidemiology, 2) Human volunteer experiments, 3) Animal experiments, 4) Cell experiments
- (3) Biological effects of other electromagnetic fields that influence the challenges posed by the biological effects of the aforementioned electromagnetic field
- (4) Risk management and risk communication
- (5) Other(s)

4. Expected effects

This study will provide basic data for the development of viable technologies and the effective use of electromagnetic field energy from the perspective of the electromagnetic compatibility of living organisms by grasping the latest research and risk-management trends concerning the biological effects of electromagnetic fields via the cooperation of researchers and engineers in a wide range of fields encompassing medicine and biology, in addition to electrical engineering.

5. Term of investigation

July 2021 to June 2024

6. Committee members

Position	Name	Affiliation	Member/Non-member category of IEEJ
Chairperson	Masateru Ikehata	Railway Technical Research Institute	Member
Member	Akira Ushiyama	National Institute of Public Health	Non-member
"	Hiroshi Inoue	Japan Electrical Manufacturers' Association	Member
"	Chiyoji Ohkubo	Japan Electrical Safety & Environment Technology Laboratories	Member
"	Makiko Kakikawa	Kanazawa University	Member
"	Yoshitsugu Kamimura	Utsunomiya University	Member
"	Junichi Kitano	Central Japan Railway Company	Member
"	Takahiro Kudo	Transmission & Distribution Grid Council.	Member
"	Noriko Kojimahara	Shizuoka Prefectural Hospital Organization	Non-member
"	Masahiro Kobayashi	Tokyo Electric Power Company Power Grid, Inc.	Non-member
"	Tsukasa Shigemitsu	-	Member
"	Masao Taki	Tokyo Metropolitan University	Member

Position	Name	Affiliation	Member/Non-member category of IEEJ
Member	Satoshi Nakasono	Central Research Institute of Electric Power Industry	Member
"	Maya Mizuno	National Institute of Information and Communications Technology	Member
"	Junji Miyakoshi	Kyoto University	Member
	Sachiko Yamaguchi	National Institute of Occupational Safety and Health, Japan	Member
	Keita Yamazaki	Takenaka Corporation	Non-member
"	Kenichi Yamazaki	Central Research Institute of Electric Power Industry	Member
Secretary	Masayuki Takahashi	Central Research Institute of Electric Power Industry	Member
"	Hiroaki Miyagi	HM Research & Consulting, Inc.	Member
Assistant secretary	Tomomichi Omote	Japan Electrical Safety & Environment Technology Laboratories	Member

7. Activity schedule

Committee meetings: 3 times/year; Technical Meeting: 1 time/year; Secretariat: 2 times/year

8. Reporting format

A technical report shall be prepared to present the results, and if possible, a technical book shall be published.