

Cores Symposium on non-ionizing radiation (NIR) research and safety

Research needs

From the point of view of STUK as radiation protection authority, current topics deserving additional research include the following:

- Addiction to UV radiation
- Health effects of long-term exposure to electromagnetic fields (LF and RF)
 - EMFs from mobile phones
 - Magnetic fields from power lines and other appliances used for the transmission and distribution of electricity
- Health effects of exposure to intermediate frequency (300 Hz to 10 MHz) EMFs
- Interaction mechanisms of low-level EMFs (below exposure limit values)

The role of Cores in the field of NIR is seen important for the exchange of information and discussion on the recent research results, as national (and international) multidisciplinary network of experts, and for the cooperation in the research.

Along with digitalization, there is a growing number of new applications utilizing and emitting EMFs, and standardization and risk communication must keep up with these developments. New technologies utilizing NIR include wireless power transfer, 5G technology and Internet of Things. Wireless devices also include various sensors attached to or inside the human body. Cosmetic NIR appliances include lasers, pulsed light, electromagnetic fields and ultrasound, often operated by personnel without medical training.

The conclusion of the Symposium was that research on the health effects of long-term exposure to electromagnetic fields (both low and radiofrequency fields) is still needed. Also, studies on interaction mechanisms of low-level EMFs (below exposure limit values) are important.

The international GERoNiMO study has provided information on the health effects of exposure to intermediate frequency electromagnetic fields (300 Hz to 10 MHz) but further research is still needed. There are emerging technologies utilizing these fields (for example, wireless power transfer).

The possible association between extremely low frequency magnetic fields and neurodegenerative studies was pointed out during the discussion. Both experimental and epidemiological studies on this are needed. Collaboration with researchers studying neurodegenerative diseases would be beneficial. For example, there are several research groups studying neurodegenerative diseases at University of Eastern Finland. In cancer research, electromagnetic fields have commonly been studied together with other exposures and possible combined effects have been investigated. This might be a good approach also for the studies related to neurodegenerative diseases.

Research on the potential beneficial effects of electromagnetic fields, for example those discussed by Dr. Maria Rosaria Scarfi during the symposium, should not be omitted. Also, the possibility to enhance radiotherapy with magnetic fields is an important area for study. This question is also highly related to radiation safety.

Concerning UV radiation, more detailed information on UV addiction would be useful. Also, further experimental studies concerning the role of UVA are encouraged.

How to fund studies

STUK has internal calls of research projects (1-2 million euro available per year). There is a possibility for collaboration between STUK and universities in areas that support NIR surveillance. STUK hires the

personnel for these projects but the practical work can be carried out in universities. Research programme initiatives to Academy of Finland are important. The collaboration between the Cores institutes is needed to increase the impact.

European researchers in the field of ionizing radiation are quite well organized and researchers themselves prepare the Strategic Research Agendas guiding the calls for funding. It could be considered whether this kind of organization would be useful also in the field of non-ionizing radiation to promote European funding. In the next framework programme, Horizon Europe, innovations supporting the competitiveness of European economy have a key role. Technological innovations utilize EMFs and standards are needed for safety as well as commercialization of innovations.