CORES Symposium
Technological Development and Innovations Supporting 3S Applications (Safety, Security and Safeguards)

5th-6th May 2020, University of Jyväskylä

The symposium will bring together scientists working in the broad fields of radiation research and information technologies, in particular from the Consortium on Radiation Safety Research (CORES, see www.cores.fi), along with stakeholders and end-users of the research. The objective is to share experience in the use of fundamental nuclear physics, radiation detection methods and data analysis techniques and consider their application to provide improved radiation safety, security and safeguards for society as a whole.

The programme

The programme will consist of invited presentations and oral presentations selected on the basis of submitted abstracts. The plenary presentations will give an overall introduction to the applications of nuclear physics, methods and data for Safety, Security and Safeguards purposes and highlight the possibilities of employing emerging technologies and applications making use of information technology. A discussion on the future research needs will be convened towards the end of to symposium in order to collect ideas and make recommendations for future research in the national programme and to enhance participation at the Nordic, European and International level.

The sessions will be devoted to Safety, Security and Safeguards applications, the underlying science and technological developments that enable new approaches. Efficient, comprehensive and real-time exploitation of data/knowledge enables improved decision-making both in radiation and nuclear emergencies and security and safeguards applications. Various sensor networks and sensor-carrying platforms such as drones and robots as well as communication of systems via the internet (IoT) are becoming more prevalent. In addition to sensors, large amounts of data are produced by simulation and via collection from other sources such as the internet. Optimal use of data from different sources calls for high performance information processing as well as agreement on data formats and protocols. Combining simulations and empirical data by data fusion would improve modelling and predictions on the evolution of the radiological situation in emergencies.

Many of the applications in **Safety** are related to emergency preparedness and response after radiological and nuclear accidents. Despite all preventive radiation and nuclear safety actions the possibility of a radiation emergency situation cannot be excluded. For example, a severe emergency affecting a wide area in Finland may be caused by a serious nuclear power plant accident at a domestic or nearby foreign plant. In addition to preparing for nuclear and radiological accidents, efforts are also needed to prevent malevolent use of radiation. Measurements and technology in general are an essential part of both emergency management and nuclear security activities. An introduction will be given to the decision-making process and cooperation in nuclear and radiological emergencies, and the main tools supporting decision making in case of environmental release, such as dispersion modelling, source tracking, monitoring strategies, measurement networks, mobile measurements, laboratories and air-borne mapping of fallout will be discussed. Emerging technologies bring new opportunities such as the use of

robots and drones both in the field and in laboratories and the use of machine-learning in the evaluation of data. Citizen science also plays a role in radiation detection and data and information from various sources can be exploited in situation awareness. Data assimilation provides feedback to simulations from actual measurements. Virtual and augmented reality and use of simulated radiation fields also support education and training.

Nuclear **Security** is part of national security and is a genuine 24/7 multi-authority activity. Nuclear security is linked to national security, for example, through the national CBRNE strategy. There are several groups under the CBRNE Coordinating Body. One of the groups focuses on research, development and education. STUK participates in the work of the Coordinating Body and its sub-groups. The Finnish nuclear security detection architecture (NSDA) for nuclear and other radioactive materials out of regulatory control is currently being updated. The NSDA materializes the CBRNE strategy on a general and public level. The NSDA covers all national technical and non-technical detection systems for nuclear security. The key cross-cutting theme of our NSDA is reachback: remote expert support of field teams. This mode of operation requires that the measuring devices are able to store their measurement data also to a remote database that is accessible by radiation detection specialists. This approach was selected since nuclear security measurements involve several different authorities across Finland and not all of them have their own radiation specialists to adjudicate the instrument alarms. In addition, spectrometric instruments are becoming frequently used in nuclear security.

Safeguards of nuclear materials are the prerequisite of the use of Nuclear Energy in the countries who are parties of the Non-Proliferation Treaty (NPT). The vast majority of the states belong to this group. Safeguards are internationally implemented by the IAEA who has conducted safeguards agreements with NPT member states. IAEA collects and evaluates safeguards relevant information, plans and conducts safeguards activities and draws safeguards conclusions. Safeguards are implemented in international cooperation. Members States of NTP shall establish State Systems to facilitate IAEA safeguards. In some part of the world also regional systems (like Euratom) have been established. More effective and efficient technical tools for safeguards activities are also developed in international cooperation. Finland has been particularly active in development of spent fuel verification methods and techniques. These methods are useful, for instance, in connection with final disposal of spent nuclear fuel. When the spent nuclear fuel is disposed deep below the surface, it goes beyond any practical verification methods. Therefore, it is of specific importance to verify the fuel to be disposed with great accuracy and reliability beforehand, so the future generations can be provided confirmed, accurate and reliable information about the content of the repository.

Participation and Registration

The submission of abstracts for oral and poster presentations is expected by 6th of March 2020. The symposium is open for participation by Cores researchers and stakeholders. A maximum of 60 participants are allowed. There is no registration fee, but preregistrations are required via the link:

https://www.lyyti.in/3S_Symposium_6378