Finnish Special Session

Cryogenics role in quantum technology

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Abstract
Quantum technology has the promise of taking detection, information security and computation technologies beyond the capabilities of current state of the art by harvesting the quantum nature of things. Many of the technologies that explore the advantages of quantum nature require a measurement infrastructure that can operate at cryogenic temperatures, down to a few thousandths of a kelvin. This is especially true for many of the current efforts for creating a quantum computer. Bluefors is the leading company in the world providing tools for a cryogenic measurement infrastructure and has a key role in the supply chain of quantum computation. In this talk, I will give a brief background of Bluefors and our forecast on how modern cryogenics is a possibility for pursuing quantum technologies.

Biography
David Gunnarsson, CSO, is heading the R&D department at Bluefors Oy. In this position he leads Bluefors' cryogenic development for the quantum technology community. He holds a Ph. D. degree from Chalmers University of Technology, Sweden, 2005, on his work on the Josephson junction based quantum bit. After his Ph. D. he continued research at Low Temperature Laboratory, Helsinki University of Technology (2005-2008) and prior to joining Bluefors, he worked as a Senior Scientist at VTT Technical Research Centre of Finland (2008-2015). With his background in both microfabrication and cryogenic measurements of superconducting quantum circuits, he has a broad knowledge of the future requirements in cryogenics for the quantum computation field.

Spectral Imaging Cameras with Application Examples

J. Kalliopuska
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Abstract
ADVACAM has been able to successfully commercialize photon counting technology developed at CERN's Medipix collaboration. ADVACAM utilizes different Medipix readout chips, namely Timepix, Medipix3 and Timepix3, for spectral imaging of X-ray and gamma radiation. Each readout possesses different properties suitable for different applications. Presentation introduces the photon counting technology and gives several application examples. The multi threshold spectral X-ray imaging in non-destructive testing (NDT) enables material discrimination that is used in radiography, computed tomography and high speed conveyer belt or robotic scanning applications. The fully spectral X-ray imaging in the NDT enables subpixel resolution down to 9 um resolution without need of geometric magnification. The energy dispersive X-ray diffraction (XRD) using the fully spectral X-ray detector speeds up the sample analysis by a factor of 100 using a simple polychromatic XRD setup without moving parts. Finally the fully spectral radiation imaging detector enables a lightweight single layer compton cameras for identification radiation sources and their location. The applications of the compton camera are found in medical imaging, nuclear safety and security.

Biography
Dr. Juha Kalliopuska, Chief Executive Officer, Co-founder of ADVACAM Oy. ADVACAM Oy, established in 2012, is a one-stop shop for radiation detector manufacturing and micropackaging services. Juha has extensive knowledge in silicon sensor manufacturing and has worked to develop the core edgeless sensor building block for the hybrid sensors that allows scalability of the detector area of ADVACAM's camera products. Juha has long-term experience in customer relationship and sales development, starting in his previous job at VTT Technical Research Centre of Finland from 2003-2013.