



1-2 Postdoc/Researcher Fellowship positions “Therapeutic Applications of Electromagnetics in Biomed

About the position

1-2 Postdoc/Researcher Fellowship positions “Therapeutic Applications of Electromagnetics in Biomedicine for Heart and Brain Applications”

Keywords: Focused Microwave, Terahertz, nanoparticles, controlled ablation, targeted drug delivery, wireless power transfer, wireless activation, actuation, and pacing functions.

The position reports to head of department

Job description

The Wireless In-body Sensor and Actuator Network (WINNOWER) is a research project funded by the Research Council of Norway, NTNU and Oslo University Hospital. The primary objective of the WINNOWER project, is to 1) study the transmission characteristics of different wireless sensor communication technologies, and 2) propose optimal transceiver design for ultra-low power transmission to be utilized for deep wireless in-body devices (multi-sensors and actuators). The resulting communication network will be connecting deep implants to the Internet via subcutaneous device or skin patches/tattoos. Such a network is essential for a wide range of anticipated implantable diagnostic and therapeutic medical devices. We aim study novel radio and molecular communication technologies optimized for both short range (0.05-5cm) communication between deeply implanted devices and long range (5-20 cm) connecting deeply positioned devices with subcutaneous devices enabled for off-body communications.

The aim of the GLADIATOR project is bridging life sciences, bio-nanotechnology, engineering and ICT, to provide theranostic (therapeutic+diagnostic) solution for brain malignancies. Through a multi-faceted breakthrough, GLADIATOR will provide a working prototype of a complete, autonomous and clinically applicable, nanonetwork-based, Molecular Communications system based on the conceptual framework of Externally Controllable Molecular Communications (ECMC). Using Glioblastoma Multiform tumors, the most detrimental brain pathologies, as a proof-of-concept case, GLADIATOR will implement a platform of cell-based and electronic components. Implantable autologous organoids of engineered neural stem cells (iNSCs) will release rationally designed exosomal bio-nanomachines, delivering reprogramming (therapeutic) miRNAs and building nanonetworks. Interfering with the underlying biological environment, the nanonetworks will define a revolutionary intervention. A hybrid bio-electronic interface, consisting of coupled external and implantable devices, will enable communication channels with host-derived fluorescent bio- nanomachines via micro-optoelectronic sensors. The cellular, sub-cellular and electronic components will be integrated into a wireless ECMC network. This system will autonomously monitor the spatiotemporal tumor evolution and recurrence and generate, on demand, appropriate reprogramming interventions, by radiofrequency stimulation of iNSC renewal. A paradigm shift in Oncology Research is anticipated via the supra-discipline of “bio-nanomachine diagnostics”. GLADIATOR establishes a radical long-term vision leading to a drastic change in cancer therapy, also ushering the emergence of the ECMC field and transforming the burgeoning industry of Internet of Nano-bio-things, with high socioeconomic impact.

Postdoc/researcher #1

The research deals with wireless power transfer and wireless actuation (pacing) of the heart tissues/ muscles for the sake of resynchronization and controlling the heart beats. A similar approach will be used for the brain stimulation using implanted nano/ microparticles (devices) and by manipulating the Nanodevices using magneto/ electro mechanisms in a noninvasive manner to control the brain signals for the treatment of some brain disorders.

The research project aims to develop micro/nanoscale electrodes for both human body communication and antennas for RF communications using different materials and techniques so that the antenna/electrodes and the transceiver can fit into an extremely small physical size device in the range of tens of micro-meter. The antenna and the subsequent electronics will be used to pace the heart in a controlled manner.

Postdoc/researcher #2

The researcher will work on the brain cancer treatment project using EM approaches. The task is to interact magneto or electric biocompatible nanoparticles with external signals or fields for targeted drug delivery, hyperthermia ablation or heating a target tissue or cluster of cells to make them susceptible to the other therapies.

Prerequisites

PhD in electrical engineering/ physicists with specialization in Electromagnetics, Antenna design and transceiver system design. Moreover the candidate documented research experience in using EM solvers working in broad range of frequencies from tens of MHz to sub-THz and implementing and testing the antennas and electrodes in realistic environments.

Qualification requirements

Postdoctoral fellow:

A postdoctoral research fellowships is a qualification position in which the main objective is qualification for work in academic positions. Completion of a Norwegian doctoral degree in [subject area] or corresponding foreign doctoral degree recognized as equivalent to a Norwegian

doctoral degree is required.

The candidates may have background in physics, electrical engineering, biomedical engineering, etc. He/she must be enthusiastic about reading the material from multidisciplinary science (chemistry, fluid mechanics, physics and medicine), share the findings with the other members of the team, be creative to scale some methods from the other fields in science to the project goals, have excellent knowledge in using multi-physics simulation tools (mainly COMSOL) and develop necessary numerical models of material in the simulation box. Excellent familiarity with electromagnetic simulations and modeling is a requirement. Antenna design knowledge, skills on active RF system design and familiarity using Labview are considered as positive in the evaluation process. We need a candidate who likes to learn new scientific material, be open mind and clear, participate in interdisciplinary conferences, and present the findings in highly ranked journals. The project will have two main phases including the simulation and implementation. The candidate should be self-motivated and well organized to initiate the research and bring the ideas in practice. Several in-vivo animal measurement and tests are planned during the project phases to validate some finding and make the models more confident.

- Theoretical and practical knowledge of computational electromagnetics, complex material, simulation techniques, analysis and design of RF system and well understanding of electromagnetic wave propagation in complex mediums.
- Practical experience in engineering matter from design, development, and measurements. Hands-on RF electronics and prototype design.
- Knowledge of specialist software: COMSOL Multiphysics, Matlab, CST MWS, HFSS.
- Electromagnetic coding and programming skills.
- Research creativity and strong cross-discipline collaborative ability as appropriate.
- Excellent communication skills (oral and written), including public presentations and ability to communicate complex data/concepts clearly and concisely.
- Excellent interpersonal skills including team working and a collegiate approach.
- Self-motivation, initiative, and independent thought/working
- Comfortable developing expertise in multiple fields

Language Skills: Fluent written and verbal communication skills in English are required. The following tests can be used as documentation: TOEFL, IELTS, Cambridge Certificate in Advanced English (CAE), or Cambridge Certificate of Proficiency in English (CPE). Minimum scores are:

- TOEFL: 600 (paper-based test), 92 (Internet-based test)
- IELTS: 6.5, with no section lower than 5.5 (only Academic IELTS test accepted)
- CAE/CPE: grade B or A.

Interested applicants are encouraged to apply by making a short research proposal (maximum 3 pages) for two years and a cover letter showing how the applicants' background knowledge can fit into the scopes of the project. The interview will be conducted in two steps, and the shortlisted candidates will be asked to prepare a more detailed proposal.

The application

The application must contain information of educational background and prior training, exams (BSc, MSc, PhD transcripts), and work experience. In addition, we ask the applicant to submit a research statement (max 3 pages), detailing research interests and initial plans with regard to the individual Postdoc project descriptions above. The statement should also describe why the applicant is suited for the position, and how the project relates to previous education, research and competence. Publications and other work that the applicant wishes to be taken into account must be enclosed (including a brief description of the contribution if not obvious). Incomplete applications will not be taken into consideration.

Starting date no later than 01.09.2019.

Formalities

The appointment is made in accordance with the regulations of employment for Postdoc/Researcher candidates issued by the Ministry of Education and Research, with relevant parts of the additional guidelines for appointment as a PhD candidate at NTNU.

Personal characteristics

(Skriv inn 3-5 personlige egenskaper)

- eksempel
- eksempel
- eksempel

In the evaluation of which candidate is best qualified, emphasis will be placed on education, experience and personal suitability, as well as motivation, in terms of the qualification requirements specified in the advertisement

We offer

- exciting and stimulating tasks in a strong international academic environment
- an open and [inclusive work environment](#) with dedicated colleagues
- favourable terms in the [Norwegian Public Service Pension Fund](#)
- [employee benefits](#)

Salary and conditions

Postdoc:

Postdoctoral candidates are remunerated in code 1352, and are normally remunerated at gross from NOK 515 200 before tax per year. From the salary, 2 % is deducted as a contribution to the Norwegian Public Service Pension Fund.

The engagement is to be made in accordance with the regulations in force concerning State Employees and Civil Servants, and the acts relating to Control of the Export of Strategic Goods, Services and Technology. Candidates who by assessment of the application and attachment are seen to conflict with the criterias in the latter law will be prohibited from recruitment to NTNU. After the appointment you must assume that there may be changes in the area of work.

General information

A good work environment is characterized by diversity. We encourage qualified candidates to apply, regardless of their gender, functional capacity or cultural background. Under the Freedom of Information Act (offentleglova), information about the applicant may be made public even if the applicant has requested not to have their name entered on the list of applicants.

Questions about the position can be directed to Professor Ilanko Balasingham, email: ilanko.balasingham@ntnu.no or Dr. Ali Khaleghi, email: ali.khaleghi@ntnu.no

About the application:

Publications and other academic works that the applicant would like to be considered in the evaluation must accompany the application. Joint works will be considered. If it is difficult to identify the individual applicant's contribution to joint works, the applicant must include a brief description of his or her contribution.

Please submit your application electronically via jobb norge.no with your CV, diplomas and certificates. Applicants invited for interview must include certified copies of transcripts and reference letters. **Please refer to the application number 2019/11346 when applying.**

Application deadline: 31.05.2019

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The Norwegian University of Science and Technology (NTNU) creates knowledge for a better world and solutions that can change everyday life.

Department of Electronic Systems

The digitalization of Norway is impossible without electronic systems. We are Norway's leading academic environment in this field, and contribute with our expertise in areas ranging from nanoelectronics, phototonics, signal processing, radio technology and acoustics to satellite technology and autonomous systems. Knowledge of electronic systems is also vital for addressing important challenges in transport, energy, the environment, and health. [The Department of Electronic Systems](#) is one of seven departments in the [Faculty of Information Technology and Electrical Engineering](#).

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