

Doctoral Researcher in Microwave Engineering for Next-
Generation Cellular Wireless
Aalto University

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Posted Oct. 25, 2024, set to expire Feb. 24, 2025

Job Title	Doctoral Researcher in Microwave Engineering for Next-Generation Cellular Wireless
Department	T411 Dept. Electronics and Nanoeng
Institution	Aalto University , , Finland
Date Posted	Oct. 25, 2024
Application Deadline	Open until filled
Position Start Date	Available immediately
Job Categories	Graduate Student
Academic Field(s)	Electrical and/or Electronics
Job Website	https://aalto.wd3.myworkdayjobs.com/aalto/job/Otaniemi-Espoo-Finland/Doctoral-Researcher-in-Microwave-Engineering-for-Next-Generation-Cellular-Wireless_R41267-3

Apply By Email

Job Description

Aalto University is where science and art meet technology and business. We shape a sustainable future by making research breakthroughs in and across our disciplines, sparking the game changers of tomorrow and creating novel solutions to major global challenges. Our community is made up of 13 000 students, 400 professors and close to 4 500 other faculty and staff working on our dynamic campus in Espoo, Greater Helsinki, Finland. Diversity is part of who we are, and we actively work to ensure our community's diversity and inclusiveness. This is why we warmly encourage qualified candidates from all backgrounds to join our community.

The Department of Electronics and Nanoengineering conducts research and arranges related courses in the fields of electromagnetics, micro and nanotechnology, radio engineering, and space technology.

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The department research groups have active national and international collaboration with several institutes and companies. Research groups are working with world-class research facilities and instruments; the largest clean rooms in the Nordic countries are located in the Micro- and nanotechnology centre Micronova.

We are now looking for a talented and highly motivated
Doctoral Researcher in Microwave Engineering for Next-Generation Cellular Wireless

Cellular industry has been devoting significant efforts to enhance the fifth-generation (5G) cellular, aiming at 5G-advanced and sixth-generation (6G). One of the most distinguishing features of these next generation radios is improved service coverage AND higher data rates. However, coverage and data rate are actually trade-off metrics since the radio systems that try to offer abundant bandwidth for increasing data rates are also more prone to losses in signal power transmission over-the-air; this is the first technical challenge that we address during the doctoral study. The trade-off is pronounced for indoor users, particularly for those in low- and zero-energy buildings because the highly insulated airtight building structures typically also block radio waves very effectively. Another distinguishing feature of the next generation cellular is the ability of privacy-respected sensing of surrounding environments and localization of targets by “re-using” the ambient radio communications signals. Environmental sensing and target localization of indoor users, aiming at efficient use of the energy and space and improved safety and security in the building, is typically realized by various types of cameras, but relying on optical cameras is associated with the risk of privacy violation; this is the second technical challenge to be tackled in the present doctoral thesis opportunity. The mentioned two challenges are addressed by developing indoor building elements that allow improved radio coverage for indoor users, as well as environmental sensing and target localization of indoor users. By installing many low-power indoor radio heads, connected to a base station, the proximity of the user to at least one of them ensures good signal coverage. Radio waves reach users with a smaller number of interactions with building structures, leading to smaller losses compared to the case of communicating with outdoor base stations. Furthermore, radio-based sensing and localization is inherently incapable of sensing privacy-related information of people, e.g., their physical appearance. Antenna-embedded building elements such as walls, windows, window or door frames, are therefore an attractive solution to achieve BOTH indoor radio coverage AND privacy-respecting sensing of environment and localization of targets.

Job description

A successful student will perform a range of research activities from antenna designs, multi-physics analysis of antenna-embedded building elements, their in-situ measurements and characterization in an indoor site, and finally a study of indoor sensing methods of the environment and/or target localization through the antenna-embedded building elements. The doctoral study will be performed

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always in tandem with a senior doctoral student and/or a post-doctoral researcher. Detailed guidance on research implementation and courses to take will be provided by the senior researchers and supervisor, particularly in the first 1.5 years. After that, the student will be expected to increase his/her independence gradually in implementing the research so that he/she can eventually write a doctoral thesis independently at the end of the study. The doctoral study includes mandatory completion of courses of 40 ECTS and assisting courses related to electrical engineering for two-to-three semesters. Salary will be covered during attending courses as a student and as a teaching assistant. The research work involves often-demanding numerical designs and simulations using powerful workstations, along with experimental activities to manufacture and measure the antenna embedded building elements. Meetings with fellow colleagues, advisors and the supervisor in the same research group are arranged regularly. As such, the study requires that the student be present at the office during working hours.

Eligibility and requirements

In order to be eligible for the present open doctoral student position, interested applicants must have a valid certificate from an English proficiency test and that of a Master's degree in relevant field of Electrical Engineering; see [[url=https://www.aalto.fi/en/doctoral-education/eligibility-and-language-requirements-in-doctoral-admissions](https://www.aalto.fi/en/doctoral-education/eligibility-and-language-requirements-in-doctoral-admissions)]<https://www.aalto.fi/en/doctoral-education/eligibility-and-language-requirements-in-doctoral-admissions> for eligibility where cases not requiring the said certificates are also indicated. In addition, high average grade as well as excellent grades on courses like electromagnetic fields, antennas and microwave engineering are expected. Applicants may be a fresh M.Sc in electrical engineering, or gained already some experience of antennas, microwave components and/or systems in industry. We expect the applicants to be open-minded for new research, eager to learn more, and fit to teamwork. Experience of numerical computation and electromagnetic simulation tools is expected.

Research group

The research group ([url=https://research.aalto.fi/en/organisations/katsuyuki-haneda-group-2](https://research.aalto.fi/en/organisations/katsuyuki-haneda-group-2)]<https://research.aalto.fi/en/organisations/katsuyuki-haneda-group-2>) who opens the present call-for-applications has extensive experience of antennas, radio frequency instrumentation and measurements, radio communications and radar technologies, as evidenced in scientific papers published in prestigious journals and conferences. A successful student will be working in an interdisciplinary research group involving building physicists so that multi-physics studies of the antenna-embedded building elements are efficiently performed. Our research environment benefits from the extensive computational and experimental facilities of the school, including access to cluster computers, microwave laboratory, millimeter-wave and Terahertz instruments, anechoic chamber and multiple-frequency channel sounders. The research team consists of two faculty members and six doctoral students where meetings of different sizes are organized regularly. Academic scholars and master and bachelor students are frequently visiting the group for short-term collaborative research

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and projects with us. Yearly well-being surveys of the research group have shown better scores than the national average in nearly all aspects. The group has been responsible for several award-winning under- and post-graduate courses. Academic research visits to university partners and internships to relevant industrial partners are popular among members of the research group, since they enrich experience, broaden views and understanding of our world, and expand a researcher network. The research group has also been a part of major collaboration projects with industry, including the European Horizon 2020 flagship project Hexa-X (<https://hexa-x.eu>) and Hexa-X-II (<https://hexa-x-ii.eu>), where the research group has been contributing to radio designs of beyond-5G and 6G cellular systems. Applying our scientific research results into practice through national/international collaboration with industry and regulatory bodies is one of the important missions of our research group. A successful student will have opportunities to get exposed to discussions with relevant stakeholders to develop the research further, mull over usefulness of research results, facilitate their applications to practical problems, and finally find new challenges, all of which eventually paves the carrier path of the student beyond the doctoral study.

Salary and contract terms

The expected starting salary for a doctoral researcher is approximately 2750 €/month and salary will increase with responsibilities and performance over time. The selected candidate will need to apply for the study right in doctoral studies at Aalto University School of Electrical Engineering. The following contracts are in two stages, ending up with the total of 4 years before which a doctoral thesis is supposed to be ready for reviews by external experts. As an employer, Aalto University provides excellent learning and development opportunities as well as occupational health care services, commuter ticket benefit and versatile physical activity services by Unisport. The contract includes occupational health benefits and Finland has a comprehensive social security system. The cost to move to Finland is at the applicant's own expense. Preferable starting time is in the spring 2025.

More information

If you wish to hear more about the position, please contact Professor Katsuyuki Haneda, firstname.lastname@aalto.fi. In recruitment process relating questions, please contact HR Partner Karoliina Walldén, firstname.lastname@aalto.fi.

Ready to apply?

Please submit your application documents through our recruiting system by using [Apply now!](#); link below. Please include the following documents in English:

- [Most important!] A motivation letter, maximum one A4 page, describing your research interests under the framework defined in Job description section of this call-for-applications. Please cite at least one scientific article that relates to the present research framework and indicate their relevance and importance. It is preferable if one of the citations are your own paper and the other paper is from the

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research group who published this call-for-applications.

- Course transcripts of Master's studies with grades and Certificate of Master's degree
- Curriculum Vitae (including list of publications if any)

Please make sure to create the motivation letter carefully, as evaluators pay most attention to them during a review. Application documents that do not include the motivation letter are considered incomplete and may not be reviewed.

The application period closes on March 31, 2025 but we will start reviewing candidates upon receiving complete applications that include the mentioned three documents. New complete applications will be considered until the position is filled.

Please note: Aalto University's employees should apply for the position via our internal HR system Workday (Internal Jobs) by using their existing Workday user account (not via the external webpage for open positions). Aalto University's students and visitors should apply as external candidates with personal (not aalto) email.

About Aalto University, Campus and Finland

[url=https://www.aalto.fi/school-of-electrical-engineering]The School of Electrical Engineering is located at the Aalto University Otaniemi campus in the Helsinki metropolitan area, Finland. As a living and work environment, Finland consistently ranks high in quality-of-life. For more information about living in Finland please visit our [url=https://www.aalto.fi/aalto-university/international-staff-information-package]information pages for international staff.

Contact Information

Please reference Academickeys in your cover letter when applying for or inquiring about this job announcement.

Contact

Finland