PRESS

2023/077
18.12.2023

Dr. Wilhelmy VDE Prize 2023: From new approaches to efficient product design to the use of high data rates in the THz range

- **Female scientists who develop innovative solutions to technical issues are awarded the Dr. Wilhelmy VDE Prize every year**
- **In 2023, the focus was on efficient and sustainable product design in electrical engineering and the potential of THz communication technologies**
- **The award ceremony took place as part of the VDE Capital Forum in Berlin**

(18.12.2023, Frankfurt a. M.) Once a year, the Dr. Wilhelmy Foundation and the VDE jointly award the Dr. Wilhelmy VDE Prize to up to three young female engineers in electrical engineering and information technology. The award, which is endowed with EUR 3,000 each, recognizes outstanding dissertations and makes an important contribution to countering the shortage of skilled workers in electrical engineering and information technology through positive image work. With a female student ratio of 19 percent, the subject brings up the rear among engineering degree courses. Role models such as the winners of the Dr. Wilhelmy VDE Prize are very valuable in demonstrating that women can successfully pursue their careers in electrical engineering and help shape the future. Dr.-Ing. Mona Fuhrländer, Dr.-Ing. Isabella Jolanda Lau and Dr.-Ing. Iulia Dan were honored for their work at the VDE Hauptstadtforum at the Berlin-Brandenburg Academy of Sciences and Humanities in 2023.

Award winner Dr.-Ing. Mona Fuhrländer:
Considering uncertainties in product design quickly and efficiently

Efficiency in product development and production is one of the key drivers for industry. Uncertainties that can arise due to inaccuracies in the manufacturing process or variable material properties should already be taken into account during development so that the product reliably meets the requirements at the end. At the same time, waste is reduced and time and resources are saved. In her dissertation, Dr.-Ing. Mona Fuhrländer combined classic computer

VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.
V.i.S.d.P. Head of Brand, Marketing and Communication: Thomas M. Koller
Merianstraße 28
63069 Offenbach am Main
www.vde.com
presse@vde.com

simulations with an approximation model based on machine learning in order to be able to precisely take uncertainties into account much faster than before.

The variance that occurs in the magnetization of electric motors served as an example. The strength and direction of permanent magnets vary within a permissible tolerance. Dr. Fuhrländer explains: "If I assume when designing the electric motor that the magnet meets the specifications exactly, I end up with a certain number of motors that don't work. My method helps to quickly gain an overview of such uncertainties and rule out problems." Thanks to the approximation model, only the simulations required for a valid evaluation are carried out, reducing the computing time from weeks or months to days or hours.

Dr. Mona Fuhrländer studied mathematics at the Technical University of Darmstadt and completed her dissertation "Design methods for reducing failure probabilities with examples from electrical engineering" with summa cum laude. In future, she would like to work on her goal of solving practical problems from industry with her expertise in a position in Research & Development.

Award winner Dr.-Ing. Isabella Lau:
Reducing simulation errors in the development of high-frequency components
High-frequency technology is part of modern everyday life: whether transmitting and receiving units in smartphones or distance sensors in cars, high-frequency (HF) components are installed everywhere. However, the higher the frequency and/or the narrower the frequency band used, the more important the properties of the materials used are for the functionality of the product. In her dissertation, Dr.-Ing. Isabella Lau dealt with the question of how systematic errors in the measurement of non-conductive solids, so-called dielectrics, can be minimized. Material samples differ greatly, and at the same time the measurement itself has to meet different requirements. Therefore, no universally usable measuring device is available.

Dr.-Ing. Lau states: "There are many publications and methods on this topic, but the lack of uniform evaluation parameters makes it difficult to select. My dissertation aims to facilitate the use of material measurements in combination with accurate simulations. This can save redesigns, time and resources in the development of RF components." To this end, the RF expert has developed three frequently used measurement methods, reduced possible sources of error and quantitatively evaluated the methods by statistically calculating measurement uncertainties. This significantly increased the robustness of the measurement methods. In addition, Dr. Lau has investigated in detail the influence of production-related differences in metal roughness on planar circuits and thus improved the understanding of wave propagation.

Dr.-Ing. Isabella Lau studied electrical engineering at Friedrich-Alexander-Universität Erlangen-Nürnberg and completed her dissertation "Minimization of systematic measurement errors of direct and indirect measurement methods for high-frequency extraction of the complex permittivity of solids" with summa cum laude. After moving to the Chair of Optical Quantum Technologies at FAU, Lau now works in project management.

Prize winner Dr.-Ing. Iulia Dan:
Realizing high data rates with THz technologies

The increasing demand for higher data rates is driving research into wireless transmission technologies with carrier frequencies above 200 gigahertz. For comparison: the 5G mobile communications standard currently used in Germany reaches up to 3.7 GHz. A stable high-speed wireless network would enable the rollout of many applications, from contactless interaction in automated deliveries by drones to the use of online health advisors in addition to conventional medical practices. In her dissertation, Dr. Iulia Dan focused on the question of which architectures could be used in a terrahertz communication system for 6G networks and which essential components could be used.

Dr.-Ing Dan explains: "Practical benefits are very important to me in research, and THz technologies offer many opportunities to improve everyday life. In my opinion, the two architectures that I evaluated in my work will coexist in the future, as they are suitable for different scenarios." According to Dan, the current zero-IF approach is primarily designed for applications with a known environment and known propagation paths, such as smart home applications. For the superheterodyne approach, which has not yet been used in the THz range, the radio communication specialist shows that it is very well suited for longer radio links within the network. To demonstrate this, Dan designed a wireless front end with a transmitter and a receiver for each architecture and carried out data transmission experiments.

Dr.-Ing. Iulia Dan studied electrical engineering at the University of Stuttgart and completed her dissertation "A Comparison of System Architectures for Future Wireless Links in the Terahertz Band" with summa cum laude. She is currently working in product development in the field of wireless communication for the Munich-based electronics company Rohde & Schwarz.

About VDE

VDE, one of the largest technology organizations in Europe, has been regarded as a synonym for innovation and technological progress for more than 130 years. VDE is the only organization in the world that combines science, standardization, testing, certification, and application consulting under one umbrella. The VDE mark has been synonymous with the highest safety standards and consumer protection for more than 100 years.

Our passion is the advancement of technology, the next generation of engineers and technologists, and lifelong learning and career development “on the job”. Within the VDE network more than 2,000 employees at over 60 locations worldwide, more than 100,000 honorary experts, and around 1,500 companies are dedicated to ensuring a future worth living: networked, digital, electrical. Shaping the e-dialistic future.

The VDE (VDE Association for Electrical, Electronic & Information Technologies) is headquartered in Frankfurt am Main. For more information, visit www.vde.com

Press contact: Vanessa Rothe, Phone +49 170 7645316, presse@vde.com