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*Note: Images available at:*
**Immediate Release**

# With NSF and industry support, NYU WIRELESS aims to harness the THz spectrum for amazing possibilities

BROOKLYN, New York, Weekday, Thursday, August 25, 2022 – The terahertz (THz) realm of the radio spectrum presents tantalizing possibilities (and challenges) for mobile communications and a panoply of novel applications — from see-in-the-dark sensors and revolutionary imaging and communications technologies to Tricorder-like medical devices. Realizing the potential of this underused region of the electromagnetic spectrum will require a solid foundation in THz device modeling and measurement.

NYU WIRELESS, an innovative academic research center at the NYU Tandon School of Engineering with a focus on 5G and beyond, is poised to lay the groundwork for that future, thanks to funding from the National Science Foundation for a new THz Measurement Facility. The $3 million award from the 2022 NSF MRI Program will help NYU and its collaborators, **the University of Colorado at Boulder**, **University of Nebraska–Lincoln**, and **Florida International University**, pioneer basic measurements of devices, circuits, materials, and radio propagation channels at the highest reaches of the radio spectrum.

“This generous grant will allow the center to remain at the forefront of radio propagation, channel modeling, communication system design, and material characterization, particularly as NYU WIRELESS, one of the world’s top academic telecommunications research hubs, expands into RFIC (radio-frequency integrated circuit) chip design and measurement up to 500 GHz,” said Thomas Marzetta, Director of NYU WIRELESS and Distinguished Industry Professor of Electrical and Computer Engineering.

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Added NYU WIRELESS Founding Director Theodore (Ted) S. Rappaport, Tandon's David Lee/Ernst Weber Professor of Electrical Engineering and Principal Investigator on the new NSF award, "Today's cellular telephones and wi-fi networks operate at frequencies below 100 GHz; there is great promise for greater download speeds and vast new wireless applications by moving up to the underexplored sub-THz and THz frequency bands – frequencies from 100 to 500 GHz, in both indoor and outdoor urban and rural contexts, and this support from the NSF will allow us to be at the forefront of exploring those frontiers."

The award, augmented by additional support from NYU bringing the total to over $4.3 million, will allow NYU WIRELESS to purchase new cutting-edge equipment to study propagation and channel modeling, as well as RFIC on-chip measurement capabilities up to 500 GHz, according to Rappaport. The latter capability of this new THz measurement facility aligns with the recent bipartisan CHIPS-Plus Act legislation that includes over $52 billion in subsidies for expanding semiconductor manufacturing in the U.S.

Other members of the team from NYU WIRELESS are Davood Shahrjerdi, Associate Professor of Electrical and Computer Engineering and Director of NYU Nanofabrication Facility, who explores new electronic materials and devices for making nano-engineered integrated systems; and Michael Knox , Industry Professor of Electrical and Computer Engineering, whose research foci include microwave and mmWave components, antenna design, and measurement systems.

Team members from the University of Colorado, Florida International University, and University of Nebraska, respectively are Prof. **Zoya (Zorana) Popović**, who will develop new calibration methods for characterizing RFICs at THz frequencies; Prof. **Habarakada Madanayake**, who will focus on mmWave antenna beamforming and power efficient modem designs; and Prof. **Shuai Nie**, who will explore rural wireless channels as well as factory communications at these higher frequencies. Student participants include Dipankar Shakya, a doctoral candidate at NYU WIRELESS advised by Rappaport.

"This is the largest single grant I have ever been a part of as a professor," said Rappaport. "And NYU's additional support is due to our strong partnerships of all the companies in the NYU WIRELESS Industrial Affiliates program."

This grant supports three categories of research projects at THz bands:

- RFICs and devices made of emerging materials
- Radio propagation and channel modeling
- Metrology and calibration, over the contiguous frequency range of 75 GHz to 500 GHz

The program allows for the center to lend the three partner institutions THz components for remote field measurements for wireless communications, propagation, and sensing. Additionally, evolving semiconductors and integrated circuits, as well as the next-generation electronics based on layered materials (e.g., graphene), will be measured at THz bands using the RFIC probe station.

"Just as the CHIPS Plus Act is an acknowledgement of the critical need — both from a security and supply perspective — for domestic semiconductor manufacturing, this generous grant from the NSF acknowledges the critical role advanced electronics will play in the evolution of telecommunications," said Shahrjerdi.

The THz Measurement Facility will host a robust website explaining available equipment, tutorials for learning how to use the facility, and a repository of measurement results, metrology approaches, and recent research results. It will include simulators, measurement studies, calibration results, student and collaborator activities, sponsor and vendor activities, equipment user notes, and K-12 outreach events.

“This facility will have a broad impact on the future of communications, materials, and devices,” said **Jelena Kovacevic**, Dean of NYU Tandon. “Thanks to this grant, NYU WIRELESS and its community will play a key role in paving the way, though accurate and repeatable measurements, to incredible applications for the next generations of wireless systems and devices.”

Rappaport said the study of nanotechnology devices using the RFIC probe station will enable sensing, communications, and computing that may have a transformative impact on society.

“The radio propagation measurement systems offer vital knowledge for researchers in industry, academia and international standard bodies who will design future high-speed wireless networks for 6G, 7G and beyond. They will also give students unique opportunities to investigate these new frequency bands.”

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

***About NYU WIRELESS***

*NYU WIRELESS is a vibrant academic research center that is pushing the boundaries of wireless communications, sensing, networking, and devices. Centered at NYU Tandon and involving leaders from industry, faculty, and students throughout the entire NYU community, NYU WIRELESS offers its industrial affiliates, students, and faculty members a world-class research environment that is creating fundamental knowledge, theories, and techniques for future mass-deployable wireless devices across a wide range of applications and markets. Every April, NYU WIRELESS hosts a major invitation-only wireless summit, in cooperation with Nokia Bell Laboratories, for the center’s industrial affiliates and thought leaders throughout the global telecommunications industry. For more information, visit wireless.engineering.nyu.edu.*

***About the New York University Tandon School of Engineering***

*The NYU Tandon School of Engineering dates to 1854, the founding date for both the New York University School of Civil Engineering and Architecture and the Brooklyn Collegiate and Polytechnic Institute. A January 2014 merger created a comprehensive school of education and research in engineering and applied sciences as part of a global university, with close connections to engineering programs at NYU Abu Dhabi and NYU Shanghai. NYU Tandon is rooted in a vibrant tradition of entrepreneurship, intellectual curiosity, and innovative solutions to humanity’s most pressing global challenges. Research at Tandon focuses on vital intersections between communications/IT, cybersecurity, and data science/AI/robotics systems and tools and critical areas of society that they influence, including emerging media, health, sustainability, and urban living. We believe diversity is*

*integral to excellence, and are creating a vibrant, inclusive, and equitable environment for all of our students, faculty and staff. For more information, visit engineering.nyu.edu.*

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