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*Note: Images available at <http://dam.poly.edu/?c=1647&k=7fbbf271d4>*

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## **NYU WIRELESS AND NYU STERN SCHOOL OF BUSINESS AWARDED GRANT FOR STUDY OF MILLIMETER WAVE NETWORKS**

### **First Academic Economic-Engineering Analysis of mmWaves**

The National Science Foundation (NSF) has awarded a four-year, \$750,000 grant to NYU WIRELESS and the NYU Stern School of Business to evaluate the engineering and economic aspects of millimeter wave (mmWave) spectrum and resource management. The mmWave bands are a promising new set of frequencies for next-generation cellular networks that offer orders of magnitude increased data rates relative to current 4G systems. The goal of the grant is to develop new technologies, economic models, and spectrum policy to realize the full potential of these bands.

The importance of the mmWave spectrum is driven by the tremendous demand for additional bandwidth to handle the proliferation of mobile devices and increasing amounts of data transmission. While NYU WIRELESS, its industrial affiliates and a number of other research labs have been investigating the engineering aspects of the design of mmWave cellular systems, this grant is the first large-scale academic study to consider various economic, business and policy factors. The NSF grant addresses several open questions for use of these bands, including how the mmWave spectrum should be

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valued and auctioned by the Federal Communications Commission (FCC) and how various business entities should coordinate different infrastructure and spectrum resources.

According to principal investigator Sundeep Rangan, newly promoted director of NYU WIRELESS and an associate professor in the NYU Tandon School of Engineering, “This is a significant investment on the part of NSF in advancing the field of mmWave communications. It’s gratifying to see the U.S. join together with other researchers in this important global effort to expand cellular communications capacity.”

The project brings together a unique inter-disciplinary team. Rangan and Professor Elza Erkip both faculty of the School of Engineering’s Electrical and Computer Engineering Department as well as part of the NYU WIRELESS research center. They are experts in cellular systems and wireless communications technology in general and mmWave technology specifically. Nicholas Economides is a professor of economics at the NYU Stern School of Business and is a leading authority in Internet and spectrum policy.

“The millimeter wave spectrum is a vital component of the next generation of wireless standards, which are being called ‘5G,’ and we at the National Science Foundation have been funding extensive fundamental research in this area over the past three years,” said Thyaga Nandagopal, NSF program officer for the Enhancing Access to the Radio Spectrum (EARS) Program. “This particular project aims to demonstrate the feasibility of a large-scale millimeter-wave wireless data network that can operate at gigabit speeds. It also seeks to identify regulatory and policy factors that will ensure the successful deployment of such networks in the commercial sphere.”

Given the size and importance of the global cellular industry, estimated at more than \$1 trillion, the research that will be conducted in this project has the potential to shape the evolution of spectrum policy. It is highly likely that mmWave bands will play a prominent role in the next generation of standards, given the severe shortage in conventional cellular bandwidth. MmWave wireless technology is expected to support content at speeds exceeding 10 gigabits per second, which is a thousand times today’s current mobile phone download speed.

NYU WIRELESS has already played an important role in the development of mmWave cellular systems, having conducted some of the first measurements and capacity analyses. Together with NSF, NYU WIRELESS affiliates have provided significant support of this groundbreaking research. Their research work was cited heavily by the Federal Communications Commission (FCC) in last year’s Notice of Inquiry in the study of the mmWave bands. This NSF project takes a unique, holistic approach, from its experimental design to experimental validation to policy, and includes close collaboration with leading communications companies and the FCC. All parties ultimately will be involved in putting economic models in place that ensure resource sharing pricing and licensing mechanisms to achieve the full value of the mmWave spectrum.

#### **About NYU WIRELESS**

*NYU WIRELESS is a multi-disciplinary academic research center that offers an unprecedented and unique set of skills. Centered at New York University’s Brooklyn engineering location and involving faculty and students throughout the entire NYU community, NYU WIRELESS offers its faculty and students a world-class research environment that is creating the fundamental theories and techniques for next-generation mass-deployable wireless devices across a wide range of applications and markets. This center combines NYU’s Tandon School of Engineering program, School of Medicine and Courant Institute of Mathematical Sciences, and offers a depth of expertise with unparalleled capabilities for the creation of new wireless circuits and systems as well as new health care solutions for the wireless industry. For more information, visit <http://nyuwireless.com>.*

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

The NYU Tandon School of Engineering dates to 1854, when the NYU School of Civil Engineering and Architecture as well as the Brooklyn Collegiate and Polytechnic Institute (widely known as Brooklyn Poly) were founded. Their successor institutions merged in January 2014 to create a comprehensive school of education and research in engineering and applied sciences, rooted in a tradition of invention, innovation and entrepreneurship. In addition to programs at its main campus in downtown Brooklyn, it is closely connected to engineering programs in NYU Abu Dhabi and NYU Shanghai, and it operates business incubators in downtown Manhattan and Brooklyn. For more information, visit <http://engineering.nyu.edu>.

**About the New York University Stern School of Business**

New York University Stern School of Business, located in the heart of Greenwich Village, is one of the nation's premier management education schools and research centers. NYU Stern offers a broad portfolio of academic programs at the graduate and undergraduate levels, all of them informed and enriched by the dynamism, energy and deep resources of the world's business capital. Additional information about NYU Stern School of Business is available at <http://stern.nyu.edu>.

**About NSF**

The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year (FY) 2015, its budget is \$7.3 billion. NSF funds reach all 50 states through grants to nearly 2,000 colleges, universities and other institutions. Each year, NSF receives about 48,000 competitive proposals for funding, and makes about 11,000 new funding awards. NSF also awards about \$626 million in professional and service contracts yearly.

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