Channel Modeling and Link Analysis for Small Satellite Networks at Tetrahertz Frequency Bands

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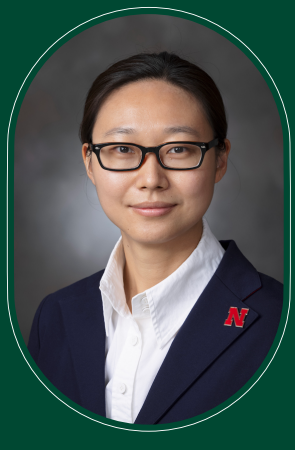
Shuai Nie has been an assistant professor in the School of Computing at the University of Nebraska-Lincoln since August 2021. She received her Ph.D. degree in Electrical and Computer Engineering from the Georgia Institute of Technology in May 2021. Shuai's research interests include physical-layer channel modeling, wireless system design, and the design of reconfigurable intelligent surfaces in millimeter wave and terahertz bands for 5G and beyond. Shuai is a recipient of the NSF-funded Nebraska Award in December 2021.



Small satellites have shorter development cycles and lower costs than the traditional satellites in low-earth and geostationary orbits. These advantages and the ultra-wide spectrum availability in the terahertz (THz) band enable profound potential for inter-satellite links (ISLs) to achieve ultra-high throughput in both near-Earth and deep-space orbits. In this talk, we will discuss the ISL channels at THz band, their characteristics, as well as the link capacity. In particular, we will take a closer look at the propagation channel effects in both Earth's upper atmosphere and deep space to demonstrate the feasibility of THz band for ISLs. We will then discuss a channel model that considers both the orbital perturbation effect and leverages diversity in both polarization and frequency domain for THz band inter-small-satellite communications. In addition, we will provide numerical results to demonstrate the achievable throughput in both near-Earth and deep-space links at THz bands. Finally, we will look at some emerging research trends and open problems in satellite communication and remote sensing that will bridge the gap of the digital divide in massive rural areas.

Zoom Link
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