

Beam Management in 5G: A Stochastic Geometry Analysis



Dr. Sanket S. Kalamkar
Qualcomm, San Diego, CA,
USA

Abstract: Beam management is central in the operation of beamformed wireless cellular systems such as 5G New Radio (NR) networks. Focusing the energy radiated to mobile terminals (MTs) by increasing the number of beams per cell increases signal power and decreases interference, and has hence the potential to bring major improvements on area spectral efficiency (ASE). This work proposes a first system-level stochastic geometry model encompassing major aspects of the beam management problem: frequencies, antenna configurations, and propagation; physical layer, wireless links, and coding; network geometry, interference, and resource sharing; sensing, signaling, and mobility management. This model leads to a simple analytical expression for the effective rate that the typical user gets in this context. This in turn allows one to find the number of beams per cell and per MT that maximizes the effective ASE by offering the best tradeoff between beamforming gains and beam management operational overheads and costs, for a wide variety of 5G network scenarios including millimeter wave (mmWave) and sub-6 GHz. As part of the system-level analysis, we define and analyze several underlying new and fundamental performance metrics that are of independent interest. We will also discuss the effects of different systemic tradeoffs and performance optimizations of mmWave and sub-6 GHz 5G deployments.

Bio: Sanket S. Kalamkar (<https://skalamkar.github.io/>) received the B.Tech. degree from the College of Engineering Pune, India, and the Ph.D. degree in electrical engineering from the Indian Institute of Technology (IIT) Kanpur, India. He is currently working as a Systems Staff Engineer with Qualcomm Technologies Inc., San Diego, CA, USA. Before that, he was a Researcher at INRIA, Paris, France, a Simons Postdoctoral Fellow with the University of Texas at Austin, Texas, USA, and a Postdoctoral Research Associate with the University of Notre Dame, IN, USA. His research interests include wireless communications, spectrum sharing, vehicular networks, XR over wireless, and green communications. He received the Tata Consultancy Services (TCS) research Fellowship and the Dhirubhai Ambani Scholarship. He also received a Best Paper Award at IEEE GLOBECOM 2020.

Date: 20th Oct 2021, Wednesday

Time: 10:30 AM

Link: <https://meet.google.com/qvp-rswr-vje>

