**NYU WIRELESS Project Proposal**

**Propagation modeling for cellular networks**

Shadow fading is typically modeled for point-to-point communications. In this proposal, we aim to find out how correlations in shadow fading in a cellular environment can be modeled in a two dimensional area, so that the effect of relays, and the duration of shadow fading for mobile users can be realistically  predicted using  a generalized model. This model can then be used for higher network layer system modeling.

Shadowing due to buildings and other obstructions will have to be modeled for 5G mmWave infrastructure planning. In the mmWave band, the radio propagation environment is very different from legacy cellular bands. Due to the high absorption ratio of many building materials in the mmWave band, most of the links would be a line-of-sight link or a link with one strong reflection. Also, the scale of the obstacles could be much smaller, and we expect the spatial correlation of shadowing is much smaller. We propose to study the effectiveness of relaying technology under such an environment. We would also study the impact of human body absorption. The number of relays needed will be driven by range limitations, but also by shadowing effects. This model will help predict the number of relays needed for adequate coverage, and also to keep the area of outages for mobiles below a threshold that will be meet the application's QoS requirements. This will build on the NYU Wireless propagation measurements and papers. We have some preliminary results that mathematically show the spatial correlation due to shadowing, which, with a mobility model, will be able to predict interruptions in a typical application, e.g., video streaming.

The faculty working on this proposed research are: Shiv Panwar, Henry Bertoni, Sundeep Rangan and Ted Rappaport. A PhD student, Tingting Lu, has some preliminary results. The modeling work will lead to a paper submission to ICC/Globecom/VTC in one year. We have had preliminary discussions with Samsung at the 5G Summit and they are interested in the general area. We expect that Tingting should finish her PhD in 2 years. The work is currently being supported by CATT.