Optoelectronics with 2D materials from microscopic modeling

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In recent years, 2D materials, such transition metal dichalcogenides, have attracted much attention due to their excellent transport and optical properties. Using a Bethe-Salpeter equation, we investigate optical and excitonic properties of MoS_2 monolayers in an applied in-plane electric field [1]. We predict a quadratic Stark shift and its scaling with the exciton binding energy, determined by the dielectric environment. I will discuss our recent results on plasmon scaling in graphene nanoribon arrays as a function of nanoribbon width, spacing between ribbons, and doping level [2].

[1] B. Scharf, T. Frank, M. Gmitra, J. Fabian, I. Zutic, and V. Perebeinos, Phys. Rev. B **94**, 245434 (2016).

[2] V. Semenenko, S. Schuler, T. Mueller, and V. Perebeinos, ACS Photonics **5**, 3459-3465 (2018)

Short Bio:

Vasili Perebeinos is a Fellow of the American Physical Society. He received Diploma in 1997 in Physics from the Moscow State University, Russia, and PhD degree in 2001 in Physics from the State University of New York at Stony Brook, USA. He worked as a Research Associate in the condensed matter theory group at Brookhaven National Lab (for 2 years) and as a Visiting Scientist (for 2 years) and as Research Staff Member (for 9 years) at IBM T. J. Watson Research Center. His research interests are in the area of advanced materials and nanostructures for electronics and optoelectronics, specifically 1D carbon nanotubes and novel 2D materials. He joined University at Buffalo in 2018 from the faculty at an English speaking Skolkovo Institute of Science and Technology (Skoltech), Moscow, Russia where he was since June 2014. He published over 80 papers cited ~12000 (h index 48).