Ningchuan Zhang* (nzhang28@illinois.edu). Analogs of Dirichlet $L$-functions in $K(1)$-local homotopy theory.

The relation between Eisenstein series and the $J$-homomorphism is an important topic in $K(1)$-local homotopy theory. Both sides are related to the special values of the Riemann $\zeta$-function. This relation is most clearly understood in the context of elliptic cohomology and topological modular forms.

Number theorists have studied the twistings of the Riemann $\zeta$-functions and Eisenstein series by Dirichlet characters. In this talk, we investigate the analogs of Dirichlet character twistings in homotopy theory. We will introduce the Dirichlet twists of the $J$-spectrum. The homotopy groups of these Dirichlet $J$-spectra are related to the special values of the Dirichlet $L$-functions, and thus to congruences of the twisted Eisenstein series. We will explain the connection between Dirichlet $J$-spectra and the twisted Eisenstein series by generalizing Katz's algebro-geometric explanation of congruences of the normalized Eisenstein series. (Received September 14, 2019)