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**Harris Ahmed Mohammed Ismail\*** (moham189@uic.edu). *On some applications of a generalized Dwork trace formula to  $L$ -functions associated to exponential sums over Galois rings.*

The Dwork trace formula is a seminal result proven by Bernard Dwork in his celebrated proof of the rationality of the zeta function of an algebraic variety over a finite field. In this talk, I will begin with a brief discussion on proving a generalization of the Dwork trace formula that applies to exponential sums over Galois rings and the associated  $L$ -functions. (Galois rings are rings of Witt vectors of a finite field having a fixed finite length). The trace formula extends naturally on the cohomology of the analogue of the Dwork complex for these exponential sums over Galois rings as well. I will then briefly explain how the rationality and the bounds on the degree (the number of zeros minus the number of poles) of the associated  $L$ -function (or its reciprocal) are obtained by extending the classical arguments of Dwork, Bombieri, Adolphson and Sperber. I will conclude with a brief discussion on some interesting applications and extensions of this work that include point counts of affine varieties over Galois rings, Chevalley-Warning-Ax-Katz's estimates on the  $p$ -divisibility of such point counts, and more. (Received August 19, 2019)