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# Sum-product theorems, exponential sum bounds and applications

Mei-Chu Chang  
`mcc@math.ucr.edu`  
*University of California Riverside*  
*900 Big Springs Drive*  
*Riverside, 92521*  
*USA*

## **Abstract**

We establish new bounds on Gauss sums over arbitrary finite fields and  $\mathbb{Z}_q$  for  $q$  a composite modulus. Various applications are given: to Heilbronn sums, the minimum norm in residue classes of quotients by ideals in number fields and the distribution of orbits under Galois dynamics.

*Joint work with J. Bourgain.*