

We improve 1987 estimates of Patterson for sums of quartic Gauss sums over primes. Our Type-I and Type-II estimates feature new ideas, including use of the quadratic large sieve over the Gaussian quadratic field, and Suzuki's evaluation of the Fourier-Whittaker coefficients of quartic theta functions at squares. We also conjecture asymptotics for certain moments of quartic Gauss sums over primes. This is a joint work with C. David, A. Hamieh and H. Lin.