On sets of large exponential sums

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Abstract

Let A be a subset of Z/NZ and let R be the set of large Fourier coefficients of A. Properties of R have been studied in works of Chang and Green. Our result is the following: the number of quadruples $(r_1, r_2, r_3, r_4) \in R^4$ such that $r_1 + r_2 = r_3 + r_4$ is greater then $|R|^{2+\varepsilon}$, $\varepsilon > 0$. This statement shows that the set R is highly structured. We also discuss some of the generalizations and applications of our result.