On Kloosterman Sums with Oscillating Coefficients

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Abstract. In this paper we prove: for any positive integers $a$ and $q$ with $(a, q) = 1$, we have uniformly

$$
\sum_{\substack{n \leq N \\ (n, q)=1, \overline{n} \equiv 1 \pmod{q}}} \mu(n) e \left( \frac{an}{q} \right) \ll N d(q) \left\{ \log^2 \frac{N}{q^2} + \frac{q^2 \log^2 \frac{13}{5} N}{N^3} \right\}.
$$

This improves the previous bound obtained by D. Hajela, A. Pollington and B. Smith [5].