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Diophantine inequalities and Gowers norms

Let L be an m-by-d matrix with real coefficients and let $\varepsilon > 0$. Using work of Parsell from 2002, it is possible to prove an asymptotic formula for the number of solutions in prime numbers $\mathbf{p} = (p_1, \ldots, p_d)$ to the diophantine inequality

$$\|L\mathbf{p}\|_\infty \leqslant \varepsilon,$$

provided $d \geqslant 2m + 1$ (and L is suitably generic). In this talk we will discuss how to use some ideas from the theory of higher order Fourier analysis to prove an asymptotic formula under the weaker condition $d \geqslant m + 2$, provided L has algebraic coefficients. Our results will also have applications for cancellation of the Möbius function over certain patterns.