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Angel Kumchev*, Department of Mathematics, Towson University, Towson, MD 21252.

Diophantine inequalities with prime unknowns. Preliminary report.

Let $\lambda_1, \dots, \lambda_s$ be nonzero real numbers, not all of the same sign and such that some ratio λ_i/λ_j is irrational. Let $D(k)$ denote the least integer s such that, under the above assumptions, the sums of the form $\lambda_1 p_1^k + \dots + \lambda_s p_s^k$, where p_1, \dots, p_s are primes, are dense in \mathbb{R} . The problem of estimating the function $D(k)$ is one of the standard versions for Diophantine inequalities of the classical Waring-Goldbach problem. In this talk, I will announce some new results on counting solutions of Diophantine inequalities with variables in diminishing ranges. Those results allow us to obtain new bounds for $D(4)$ and $D(5)$, which improve on the previously known results and close the gap between what is known about $D(k)$ and what is known about the Waring-Goldbach problem. (Received August 17, 2012)