

Let  $k$  be an even integer and  $r_k(n)$  denote the number of representations of  $n$  as a sum of  $k$  squares. The generating function for  $r_k(n)$  is a weight  $k/2$  modular form of level 4. This generating function can be decomposed as a linear combination

$$E + \sum_i c_i g_i(d_i z)$$

where  $E$  is an Eisenstein series. The  $d_i$  and the levels of the newforms  $g_i$  are in the set  $\{1, 2, 4\}$ . We study the constants  $c_i$ , which dictate how large the "error term" is in the circle method approximation for  $r_k(n)$ . We will report on some surprising results when  $d_i = 1$ .