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Keivan Mallahi-Karai* (k.mallahikarai@jacobs-university.de), Campus Ring I, 28759 Bremen, Bremen, Germany, **Mohammad Bardestani** (mohammad.bardestani@gmail.com), Centre for Mathematical Sciences, University of Cambridge, Wilberforce Road, Cambridge, CB3 0WB, United Kingdom, and **Hadi Salmasian** (hadi.salmasian@uottawa.ca), 585 King Edward Ave., Ottawa, Ontario K1N 6N5, Canada. *Kirillov's orbit method and the polynomiality of the essential dimension of p -groups.*

Let G be a finite group. The faithful dimension of G is defined to be the smallest possible dimension for a faithful complex representation of G . Aside from its intrinsic interest, the problem of determining the faithful dimension of finite groups is intimately related to the notion of essential dimension, introduced by Buhler and Reichstein.

In this paper, we will use Kirillov's orbit method to address this problem for groups parameterized by a prime parameter p (e.g., Heisenberg groups over finite fields with p elements) and study the question of the dependence of the faithful dimension on p . As it will be shown, in general, this function is always a piecewise polynomial along certain "number-theoretically defined" sets, while, in some specific cases, it is given by a uniform polynomial in p . (Received January 27, 2018)