1162-05-193 **Sebastian M Cioaba***, Department of Mathematical Sciences, Ewing Hall, Newark, DE 19716-2553. *Eigenvalues and linear programming bounds for regular graphs and hypergraphs.* Preliminary report.

The spectrum of a graph is closely related to many graph parameters. In particular, the spectral gap of a regular graph which is the difference between its valency and second eigenvalue, is widely seen an algebraic measure of connectivity and plays a key role in the theory of expander graphs. In this paper, we extend previous work done for graphs and bipartite graphs and present a linear programming method for obtaining an upper bound on the order of a regular uniform hypergraph with prescribed distinct eigenvalues. Furthermore, we obtain a general upper bound on the order of a regular uniform hypergraph whose second eigenvalue is bounded by a given value. Our results improve or generalize some results obtained by Feng–Li (1996) in the context of Alon-Boppana theorems for regular hypergraphs and by Dinitz–Schapira–Shahaf (2020) in the context of the Moore or degree-diameter problem. We also determine the largest order of an r-regular u-uniform hypergraph with second eigenvalue at most θ for several parameters (r, u, θ). In particular, orthogonal arrays give the structure of the largest hypergraphs with second eigenvalue at most 1 for every sufficiently large r. This is joint work with Jack Koolen, Masato Mimura, Hiroshi Nozaki and Takayuki Okuda. (Received August 31, 2020)