

On vertex-transitive antipodal distance-regular graphs of diameter three with primitive almost simple antipodal groups

Ludmila Yu. Tsiovkina

N.N. Krasovskii Institute of Mathematics and Mechanics UB RAS, Yekaterinburg, Russia

l.tsiovkina(at)gmail.com

We consider the problem of classification of antipodal distance-regular graphs of diameter three satisfying the following condition: there is a group of automorphisms G of the graph, which acts transitively on its vertices and induces an almost simple primitive permutation group G^Σ (which will be also referred to as an antipodal group of the graph) on the set Σ of its antipodal classes.

This problem has been recently solved in the class of arc-transitive graphs (see [1–3]), in particular, arc-transitive antipodal distance-regular graphs of diameter three possess 2-transitive antipodal groups and form a quite rich class of graphs which consists of families of distance-transitive graphs together with four infinite families of arc-transitive but not distance-transitive graphs. However, very little is known in general case. Non-arc-transitive examples are provided by two Klin-Pech graphs with intersection arrays $\{35, 24, 1; 1, 12, 35\}$ and $\{44, 24, 1; 1, 12, 44\}$ with G involving the exceptional 3-cover of A_6 acting vertex-transitively and $G^\Sigma \simeq \text{Aut}(A_6)$ being of low permutation rank (≤ 5) in both cases.

Our aim is to solve this problem under the following additional conditions: permutation rank of G^Σ is not greater than 5 and $|\Sigma| \leq 2500$. In the talk, we will explore the structure of G and present feasible parameters for each antipodal distance-regular graph of diameter three with the above mentioned properties.

Acknowledgments. This work was supported by the Russian Science Foundation (Project No. 14-11-00061 P).

References

- [1] L. Yu. Tsiovkina, Two new infinite families of arc-transitive antipodal distance-regular graphs of diameter three with $\lambda = \mu$ related to groups $Sz(q)$ and ${}^2G_2(q)$. *J. Algebr. Combin.* **41**(4) (2015) 1079–1087.
- [2] L. Yu. Tsiovkina, Arc-transitive antipodal distance-regular covers of complete graphs related to $SU_3(q)$, *Discrete Math.* **340**(2) (2017) 63–71.
- [3] A. A. Makhnev, D. V. Paduchikh, L. Yu. Tsiovkina, Arc-transitive distance-regular covers of complete graphs: the almost simple case, *Algebra and Logic*, in press.