TRUDY INSTITUTA MATEMATIKI I MEKHANIKI UrO RAN

Vol. 24 No. 3 **2018**

MSC: 05C25

DOI: 10.21538/0134-4889-2018-24-3-155-163

CODES IN DISTANCE-REGULAR GRAPHS WITH $\theta_2 = -1$

M. S. Nirova

If a distance-regular graph Γ of diameter 3 contains a maximal 1-code C that is both locally regular and last subconstituent perfect, then Γ has intersection array $\{a(p+1), cp, a+1; 1, c, ap\}$ or $\{a(p+1), (a+1)p, c; 1, c, ap\}$, where $a = a_3$, $c = c_2$, and $p = p_{33}^3$ (Jurišić and Vidali). In first case, Γ has eigenvalue $\theta_2 = -1$ and the graph Γ_3 is pseudogeometric for $GQ(p+1, a)$. In the second case, Γ is a Shilla graph. We study graphs with intersection array $\{a(p+1), cp, a+1; 1, c, ap\}$ in which any two vertices at distance 3 are in a maximal 1-code. In particular, we find four new infinite families of intersection arrays: $\{a(a-2), (a-1)(a-3), a+1; 1, a-1, a(a-3)\}$ for $a \geq 5$, $\{a(2a+3), 2(a-1)(a+1), a+1; 1, a-1, 2a(a+1)\}$ for a not congruent to 1 modulo 3, $\{a(2a-3), 2(a-1)(a-2), a+1; 1, a-1, 2a(a-2)\}$ for even a not congruent to 1 modulo 3, and $\{a(3a-4), (a-1)(3a-5), a+1; 1, a-1, a(3a-5)\}$ for even a congruent to 0 or 2 modulo 5.

Keywords: distance-regular graph, maximal code.

REFERENCES

1. Brouwer A.E., Cohen A.M., Neumaier A. Distance-regular graphs. Berlin; Heidelberg; N Y: Springer-Verlag, 1989, 495 p. ISBN: 0387506195 .
2. Jurisic A., Vidali J. Extremal 1-codes in distance-regular graphs of diameter 3. *Des. Codes Cryptogr.*, 2012, vol. 65, no. 1-2, pp. 29–47. doi: 10.1007/s10623-012-9651-0 .
3. Makhnev A.A., Nirova M.S. Distance-regular Shilla graphs with $b_2 = c_2$. *Math. Notes*, 2018, vol. 103, no. 5-6, pp. 780–792. doi: 10.1134/S0001434618050103 .
4. Koolen J.H., Park J. Shilla distance-regular graphs. *Europ. J. Comb.*, 2010, vol. 31, no. 8, pp. 2064–2073. doi: 10.1016/j.ejc.2010.05.012 .
5. Koolen J.H., Park J., Yu H. An inequality involving the second largest and smallest eigenvalue of a distance-regular graph. *Linear Algebra Appl.*, 2011, vol. 434, no. 12, pp. 2404–2412. doi: 10.1016/j.laa.2010.12.032 .
6. Makhnev A.A. On graphs in which the Hoffman bound for cocliques equals the Cvetcovich bound. *Dokl. Math.*, 2011, vol. 83, no. 3, pp. 340–343. doi: 10.1134/S106456241 .
7. Makhnev A.A. Jr., Makhnev A.A. Ovoids and bipartite subgraphs in generalized quadrangles. *Math. Notes*, 2003, vol. 73, iss. 5-6, pp. 829–837. doi: 10.1023/A:102405391 .

The paper was received by the Editorial Office on June, 26, 2018.

Marina Sefovna Nirova, Cand. Sci. (Phys.-Math.), Kabardino-Balkarian State University named after H. M. Berbekov, Nal'chik, 360004 Russia, e-mail: nirova_m@mail.ru .

Cite this article as:
M. S. Nirova. Codes in distance-regular graphs with $\theta_2 = -1$, *Trudy Inst. Mat. Mekh. UrO RAN*, 2018, vol. 24, no. 3, pp. 155–163 .