

## On some class of Deza graphs without 3-cocliques

Yulia Akhkamova

*South Ural State University, Chelyabinsk, Russia*

We consider only undirected graphs, without loops and multiple edges. Let  $\Gamma$  be a graph. We will consider the following generalization of strongly regular graphs. Let  $n, k, b$  and  $a$  be integers such that  $0 \leq a \leq b \leq k < n$ . A graph  $\Gamma$  is a Deza graph with parameters  $(n, k, b, a)$  if

- (i)  $\Gamma$  has exactly  $n$  vertices;
- (ii)  $\Gamma(u, v)$  has exactly  $k$  vertices if  $u = v$ , takes on one of two values  $b$  and  $a$  otherwise.

The only difference between a strongly regular graph and a Deza graph is that the size of  $\Gamma(u, v)$ , does not necessarily depend on adjacencies. These graphs were introduced in the article by Antoine and Michel Deza [1]. So we call these graphs as Deza graphs. A strictly Deza graph is a Deza graph which is not strongly regular and has diameter 2. A coedge regular Deza graph with parameter  $\mu \in \{a, b\}$  is a Deza graph in which  $\Gamma(u, v)$  has exactly  $\mu$  vertices if  $u \neq v$  and  $u$  and  $v$  are non-adjacent.

Significant results for a strictly Deza graphs have got by M. Erickson, S. Fernando, W.H. Haemers, W.H. Hardy, J. Hemmter [2].

We consider the class of strictly Deza graphs without 3-cocliques with a small parameter  $a$ .

**Theorem.** Let  $\Gamma$  be a strictly coedge regular Deza graph without 3-cocliques and with parameters  $(n, k, b, a)$ , where  $\mu = a \leq 3$ . Then  $\Gamma$  has a parameters  $(10, 5, 4, 2)$  or  $(8, 5, 4, 2)$ . In the first case  $\Gamma$  is isomorphic to 2-coclique extension of  $C_5$ . In the second case  $\Gamma$  is isomorphic to 2-coclique extension of  $C_4$ .

A class of coedge regular Deza graphs with  $\mu = b$  and without 3-cocliques was investigated by Galina Ermakova in [3].

### References

- [1] A. Deza, M. Deza, The ridge graph of the metric polytope and some relatives // Polytopes: Abstract, convex and computational, ed. by T. Bisztriczky [et al.]. NATO ASI Series, Kluwer Academic, 1994. P. 359–372.
- [2] M. Erickson, S. Fernando, W. H. Haemers, W. H. Hardy, J. Hemmeter, Deza graphs: A generalization of strongly regular graph // J. Combin. Designs. 1999. Vol. 7, no. 6. P. 395–405.
- [3] G. Ermakova, Some properties of strictly Deza graphs without 3-cocliques and with  $\mu = b$  // Problems of Theoretical and Applied Mathematics: Proc. of the 40th Conf. of Young Scientists. Yekaterinburg: IMM UB RAS. 2009. P. 19–27.