

# ON FLAG-TRANSITIVE SYMMETRIC 2-DESIGNS ARISING FROM CAMERON-PRAEGER CONSTRUCTION

**Alessandro Montinaro**

University of Salento

(Joint work with Cheryl E. Praeger)

In 2016, based on a previous result of Sane [4], Cameron and Praeger [3] provided a construction of a family of  $2-(v, k, \lambda)$  designs with a specified point-partition  $\Sigma$ . The authors also gave necessary and sufficient conditions for a 2-design  $\mathcal{D}$  in the above mentioned family to possess a flag-transitive automorphism group  $G$  preserving the partition  $\Sigma$ , and provided remarkable examples. All the flag-transitive examples in [3] have the following features:  $\mathcal{D}$  is symmetric and satisfies the following property  $\mathcal{R}$ : *each block of imprimitivity  $\Delta$  in  $\Sigma$  has the structure of an affine resolvable  $2-(|\Delta|, \ell, \lambda_0)$ -design and  $k = \ell(|\Sigma| - 1)$ .*

The aim of the talk is to present an almost complete classification of the pair  $(\mathcal{D}, G)$  when  $\mathcal{D}$  is symmetric and has the property  $\mathcal{R}$  and  $G$  is non-solvable by combining the results in [1, 2, 3]. Consequently, we obtain an almost complete classification of the above mentioned family of flag-transitive symmetric designs arising from Cameron-Praeger construction.

## References

- [1] S. H. Alavi, M. Bayat, M. Biliotti, A. Daneshkhah, E. Francot, H. Guan, A. Montinaro, F. Mouseli, P. Rizzo, D. Tian, Y. Wang, X. Zhan, Y. Zhang, S. Zhou, Y. Zhu, Block designs with flag-transitive automorphism groups, *Results Math.* **77** (2022) 151.
- [2] R. C. Bose, A note on the resolvability of balanced incomplete block designs, *Sankhya* **6** (1942) 105-110.
- [3] P. J. Cameron C. E. Praeger, Constructing flag-transitive, point-imprimitive designs, *J. Algebr. Comb.* **43** (2016) 755–769.
- [4] S. S. Sane, On a class of symmetric designs. In: *Combinatorics and Applications* (Calcutta, 1982), pp. 292–302. Indian Statist. Inst., Calcutta (1984)