Preface

From the seminal work of Shannon of 1948 till the end of the '80s the algebraic framework of the theory of error correcting codes was within the confines of vector spaces over *finite fields*. As the beginning in the early '90s a paradigm shift occurred, and modules over finite *rings* entered the armory of coding theorists with a wide range of applications from engineering (low correlation sequences [2, 8]) to combinatorics (designs [3]), to number theory (unimodular lattices [1]). Eventually the paper [5] solved an old open problem in coding theory over fields (the formal duality of Kerdock and Preparata codes) and was awarded a best paper award for Information Theory of the IEEE Information Theory Society at the 1996 International Symposium on Information Theory in Whistler, Canada. These advances triggered a lot of research on codes over rings in the last decade. The aim of this CIMPA school was to present a survey in the more fundamental and foundational aspects of this research, and to host a mini-conference highlighting some recent results. More details on the summer school can be found on the website of CIMPA [4]. The editor gratefully acknowledges a grant from Tubitak for producing these proceedings, and the help of his co-organizers Marcus Greferath and Ferruh Ozbudak for holding the school.

In this proceedings volume, the reader will find the contributions corresponding to the courses of (by lex order on names) Serdar Boztas, Thomas Honold and Iwan Landgev, Sergio Lopez-Permouth, Jay Wood. The contributions of Alexander Nechaev is essentially covered by his chapter in Handbook of Algebra [6]. The contribution of Gabriele Nebe is covered by her book coauthored with Eric Rains and Neil Sloane [7]. The other speakers of the school were

- Marcus Greferath, Finite geometries over rings
- Tor Helleseth, Codes and sequences over $\mathbb{Z}_4$
- Philippe Langevin, Gauss sums and cyclic codes over rings
- San Ling, Quasi cyclic codes over rings

- Patrick Solé, Four Applications of $\mathbb{Z}_4$-codes and their $GR(4,2)$ analogues
- Jacques Wolfmann, Cyclic and negacyclic codes over $\mathbb{Z}_4$ and their binary images

References

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