

Report Update on Activities by Working Group 1 and 4

In the past 6 months there were a lot of activities in the framework of COST among researchers from working group 1 and 4.

Working group 1, is concerned with Bounds on the Size of Network Codes. Working group 4, is concerned with Construction of Network Codes and Grassmannian Codes.

The major event was the 7th Workshop on Coding and Systems which was held in Salamanca, Spain, July 1-3, 2015. During this workshop about 30 members of working groups 1 and 2 came together and reported on the progress of their research.

The full program and the names of the participants can be accessed under:

<http://mat.usal.es/~wcs7/>

Many members reported on new results. Quite a few preprints have been completed in this time. In the sequel we report on some of the research progress and at the end we compile the papers (as we know of them) in the bibliography.

Daniele Bartoli, Ago Riet, Peter Vandendriessche and Leo Storme have been investigating the sunflower bound for t -intersecting constant dimension subspace codes. A t -intersecting constant dimension subspace code is set of k -dimensional vector spaces pairwise intersecting in t -dimensional vector spaces. The classical example is the sunflower: a set of k -dimensional vector spaces intersecting in a common t -dimensional vector space. The sunflower bound states that if a t -intersecting constant dimension subspace code is large enough, then it is a sunflower. Daniele Bartoli, Ago Riet, Peter Vandendriessche and Leo Storme managed to improve this bound for the case $t = 1$. They are now investigating the case $t = k - 2$.

Javier de la Cruz, Michael Kiermaier and Alfred Wassermann and Wolfgang Willems came up with new constructions of MRD rank metric codes. Also Tuvi Etzion, Elisa Gorla, Alberto Ravagnani and Antonia Wachter-Zeh came up with new constructions of rank metric codes having a certain fixed Ferrers diagram shape.

The following (partial set) of papers describe more research progress which has been achieved by members of working groups 1 and 4 during the past year:

Published Papers:

1. Michael Kiermaier and Rainhard Laue “Derived and residual subspace designs”, *Advances in Mathematics of Communication* 9, 1 (2015-2), 105-115.
<http://dx.doi.org/10.3934/amc.2015.9.105>
2. Thomas Honold, Michael Kiermaier and Sascha Kurz, “Optimal binary subspace codes of length 6, constant dimension 3 and minimum subspace distance 4”, *Contemporary Mathematics* 632 (2015), ISBN 978-0-8218-9860-4, 157-176.
<http://dx.doi.org/10.1090/conm/632/12627>
3. Christine Bachoc and Martin Ehler, “Signal reconstruction from the magnitude of subspace components”, *IEEE Transactions on Information Theory* 61-7 (2015), 1-13.
4. Ante Custic, Vedran Krcadinac and Yue Zhou, “Tiling Groups with Difference Sets”, *Electronic Journal of Combinatorics*, Vol. 22, issue 2.

Preprints:

1. I. Kujas and V. Skachek, “Data Dissemination Problem in Wireless Networks”, *IEEE International Symposium on Information Theory (ISIT 2015)*, Hong Kong, SAR, June 2015.
2. Javier de la Cruz, Michael Kiermaier, Alfred Wassermann and Wolfgang Willems: “Algebraic structures of MRD Codes”, [arXiv:1502.02711](https://arxiv.org/abs/1502.02711).
3. Michael Braun, Patric Östergård and Alfred and Wassermann, “New lower bounds for constant dimension subspace codes”, preprint, 2015.
4. M. Kovacevic, “Difference Sets, Bh Sequences, and Codes in An Lattices”, submitted to *IEEE Trans. Inform. Theory*, [arXiv:1409.5276](https://arxiv.org/abs/1409.5276).
5. Javier de la Cruz, Elisa Gorla, Hiram H. Lopez and Alberto Ravagnani, “Rank distribution of Delsarte codes”, [arXiv:1510.01008](https://arxiv.org/abs/1510.01008).
6. Netanel Raviv, Antonia Wachter-Zeh: “Some Gabidulin Codes cannot be List Decoded Efficiently at any Radius”, [arXiv:1501.04272](https://arxiv.org/abs/1501.04272)
7. Eli Ben-Sasson, Tuvi Etzion, Ariel Gabizon, Netanel Raviv “Subspace Polynomials and Cyclic Subspace Codes” [arXiv:1404.7739](https://arxiv.org/abs/1404.7739)
8. Large sets of subspace designs Michael Braun, Michael Kiermaier, Axel Kohnert and Reinhard Laue [arXiv:1411.7181](https://arxiv.org/abs/1411.7181)
9. Elisa Gorla and Alberto Ravagnani “Equidistant subspace codes”, [arXiv:1507.01728](https://arxiv.org/abs/1507.01728)
10. Anna-Lena Horlemann-Trautmann, Kyle Marshall, Joachim Rosenthal “Extension of Overbeck’s Attack for Gabidulin Based Cryptosystems” [arXiv:1511.01549](https://arxiv.org/abs/1511.01549)
11. Christine Bachoc, Oriol Serra and Gilles Zmor, “An analogue of Vosper’s theorem for extension fields” [arXiv:1501.00602](https://arxiv.org/abs/1501.00602).
12. M. Kovacevic, “Difference Sets and Codes in A_n Lattices,” submitted for publication, available at [arXiv:1409.5276](https://arxiv.org/abs/1409.5276).