

A general and unifying construction for semifields and their related maximum rank distance codes

Lukas Kölsch

University of South Florida

Semifields are algebraic structures that can be for instance used to construct non-Desarguesian planes in finite geometry, as well as maximum rank distance (MRD) codes with special parameters (more precisely, every element in the code will be a square matrix with full rank). Many constructions of MRD codes are rooted in ideas from semifield theory. Interestingly, many known constructions of semifields only exist in even dimension (i.e. the dimension over the prime field is even), leading to MRD codes in even dimension or MRD codes in odd dimension over a field of even degree. In this talk, we present a unifying construction for almost all semifields of this type, including semifields found by Dickson, Knuth, Hughes-Kleinfeld, Taniguchi, Dempwolff, Bierbrauer, Zhou-Pott in the last 120 years. Our construction recovers all these semifields, and gives many new examples.