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Computing Quadratic Function Fields With High 3-Rank Via Cubic Field Tabulation

We present extensive numerical data on global quadratic function fields whose class group has positive 3-rank, obtained via an adaptation to function fields of a method due to Belabas for finding quadratic number fields of high 3-rank. Our algorithm generates fields of minimal discriminant degree for any given 3-rank. It relies on previous work by the authors for tabulating cubic function fields, but incorporates a significant computational speed-up when the quadratic extension is ramified at infinity. We provide numerical data for discriminant degree up to 11 over the finite fields of respective orders 5, 7, 11 and 13. We compare our data with a variety of heuristics on the density of such fields of a given 3-rank by Friedmann-Washington, Ellenberg et al, Achter, and Garton. In most cases, our data supports the validity of these heuristics. This is joint work with Mike Jacobson and Pieter Rozenhardt.