

## The structure of the class groups of global function fields with any unit rank

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**Abstract.** Let  $\mathbb{F}$  be a finite field and  $T$  a transcendental element over  $\mathbb{F}$ . We construct, for positive integers  $m, n$  and  $r$  with  $0 \leq r \leq m - 1$ , infinitely many global function fields  $K$  of degree  $m$  over  $\mathbb{F}(T)$  such that  $K$  has unit rank  $r$  and the ideal class group of  $K$  contains a subgroup isomorphic to  $(\mathbb{Z}/n\mathbb{Z})^{m-r}$ . This work improves Pacelli's work [11] by increasing the subgroup rank from  $m - r - 1$  to  $m - r$ , and also we obtain the result for other behavior of the prime at infinity. In particular, for the unit rank  $r = 0$ , in [7] we worked on the case in which the infinite prime is inert, so in this paper we complete the case in which the infinite prime is totally ramified. For  $0 \leq r \leq m - 1$ , we consider the following two cases for the splitting behavior of the prime at infinity: The prime at infinity splits into  $r + 1$  primes, one with relative degree  $m - r$ , the others with relative degree 1, all unramified, or the prime at infinity splits into  $r + 1$  primes, one with ramification index  $m - r$ , the others unramified, all with relative degree 1.

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