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Brauer and Neron-Severi groups of surfaces over finite fields

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For a smooth and proper surface over a finite field, the formula of Artin and Tate relates the behavior of the zeta-function at 1 to other invariants of the surface. We give a refinement which equates invariants only depending on the Brauer group to invariants only depending on the Neron-Severi group. We also give estimates of the terms appearing in the formula. This implies, for example,
the largest Brauer group of an abelian surface over the field of order $q = p^{2r}$ has order 16q, and the largest Brauer group of a supersingular abelian surface over a prime field is 36.

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