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Galois module structure of p^s th power classes of a field

When a field K contains a primitive p th root of unity, Kummer theory tells us that the \mathbb{F}_p -space $K^{\times p}/K^{\times}$ is a parameterizing space for elementary p -abelian extensions of K . In previous work, the authors computed the Galois module structure of this set when the Galois group came from an extension K/F whose Galois group is isomorphic to $\mathbb{Z}/p^n\mathbb{Z}$. In this talk we consider the more refined group $K^{\times p^s}/K^{\times}$ as a Galois module, and we report on progress in computing its structure. It appears that there is only one summand which is not free (either under the full ring or one of its natural quotients), and this summand's structure seems to be connected to the cyclotomic character and a certain family of embedding problems along the tower K/F . This work is joint with Ján Mináč and John Swallow.