

Cyclotomic Units and Greenberg's conjecture

For an abelian number field F , already Kummer (for $F = \mathbb{Q}(\zeta_n)^+$), and eventually Sinnott and others, defined the so-called *cyclotomic units* as a subgroup of full rank of the usual units \mathcal{O}_F^\times with the striking property that their index in the full group of units coincides - up to known explicit constants - with the class number of F . Let p be a prime not dividing $[F : \mathbb{Q}]$. Then Sinnott proved that these explicit constants stay bounded along the cyclotomic p -extension of F and they are prime to p : in other words, at every level F_n of the cyclotomic extension the p -part of the index of the cyclotomic units in $\mathcal{O}_{F_n}^\times$ equals the order of the p -Sylow of the class group Cl_{F_n} . It is then natural to ask whether this equality comes from an isomorphism (of abelian groups, say). Works by Kraft–Schoof and Kuz'min, later refined by Ozaki and by Belliard–Nguyen-Quang-Do, shows that if p does not split in F then a famous conjecture by Greenberg would indeed imply that the p -Sylow of Cl_{F_n} and of the quotient of $\mathcal{O}_{F_n}^\times$ by the cyclotomic units are eventually isomorphic as Galois modules. In my talk I would like to discuss the case when p splits in F , showing that Greenberg's conjecture implies that the natural map, giving the isomorphism in the non-split case, has non-trivial kernels and cokernels.