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The number of D_4-fields ordered by Artin conductor

We consider the family of D_4-quartic fields ordered by the Artin conductors of the corresponding 2-dimensional irreducible Galois representations. In this talk, I will describe ways to compute the number of such D_4-quartic fields with bounded conductor. Traditionally, there have been two approaches to counting quartic fields, using arithmetic invariant theory in combination of geometry-of-number techniques, and applying Kummer theory together with L-function methods. Both of these strategies fall short in the case of D_4 fields since counting quartic fields containing a quadratic subfield of large discriminant is difficult. However, when ordering by conductor, these techniques can be utilized due to additional algebraic structure that the Galois closures of such quartic fields have, arising from the outer automorphism of D_4. This result is joint work with Ali Altug, Arul Shankar, and Kevin Wilson.