

# Stark's Conjectures and Hilbert's 12th Problem

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Essen, November 5, 2020

## Abstract

In this talk we will discuss two central problems in algebraic number theory and their interconnections: explicit class field theory (also known as Hilbert's 12th Problem), and the special values of  $L$ -functions. The goal of explicit class field theory is to describe the abelian extensions of a ground number field via analytic means intrinsic to the ground field. Meanwhile, there is an abundance of conjectures on the special values of  $L$ -functions at certain integer points. Of these, Stark's Conjecture has special relevance toward explicit class field theory. I will describe my recent proof, joint with Mahesh Kakde, of the Brumer-Stark conjecture away from  $p = 2$ . This conjecture states the existence of certain canonical elements in CM abelian extensions of totally real fields. Next I will state a conjectural exact formula for these Brumer-Stark units that has been developed over the last 15 years. I will conclude with a description of work in progress that aims to prove this conjecture and thereby give a solution to Hilbert's 12th problem.