1048-12-174 **Erich L Kaltofen** (kaltofen@math.ncsu.edu), Dept. of Mathematics, NC State University, Raleigh, NC 27695-8205, and **Michael P Nehring*** (mpnehrin@math.ncsu.edu), Dept. of Mathematics, NC State University, Raleigh, NC 27695-8205. *Super-sparse black box rational function interpolation.* Preliminary report.

We present a method for interpolating a super-sparse univariate blackbox rational function with rational coefficients, for example, a ratio of binomials or trinomials with very high degree. We input a blackbox rational function, as well as an upper bound on the number of non-zero terms and an upper bound on the degree. The result is found by interpolating the rational function modulo a small prime p, and then applying Dirichlet's Theorem on Arithmetic Progressions to progressively lift the result to larger primes. Eventually we reach a prime number that is larger than the inputted degree bound and we can recover the original function exactly.

Furthermore, the algorithm is oblivious to whether the numerator and denominator have a common factor. The algorithm will recover the sparse form of the rational function, rather than the reduced form, which could be dense.

The algorithm, as presented, is conjectured to be polylogarithmic in the degree, but exponential in the number of terms. Therefore, it is very effective for rational functions with a small number of non-zero terms, such as the ratio of binomials, but it quickly becomes ineffective for a high number of terms. (Received February 05, 2009)