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A Combinatorial Approach to the p(t)-adic Littlewood Conjecture

Let p be a prime and let p(t) be an irreducible polynomial with coefficients
in a field K. In 2004, de Mathan and Teuli´e stated the p-adic Littlewood conjecture (p-LC) in analogy to the classical Littlewood conjecture. This talk focuses on the analogue of p-LC over the field of formal Laurent series with coefficients in K, known as the p(t)-adic Littlewood conjecture (p(t)-LC). Specifically, two metric results are provided on p(t)-LC with an additional growth function f. The first - a Khintchine- type theorem for p(t)-adic multiplicative approximation - enables one to determine the measure of the set of counterexamples to p(t)-LC for any choice of f. The second complements this by showing that the Hausdorff dimension of the same set is maximal when p(t) = t in the critical case where f = log2.
These statements are proved by developing a dictionary between Diophantine approximation in function fields and the so-called number wall of a sequence - an infinite array containing the determinant of every finite Toeplitz matrix generated by that sequence. This unique methodology provides a complementary approach to the classical strategies used to attack a problem in Diophantine approximation: namely, Ergodic Theory and Number Theory.