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Lang-Weil type bounds in finite difference fields

(joint work with Ehud Hrushovski, Jinhe Ye and Tingxiang Zou)

We prove Lang-Weil type bounds for the number of rational points of difference varieties over finite difference fields, in terms of the transformal dimension of the variety and assuming the existence of a smooth rational point. It follows that in (certain) non-principle ultraproducts of finite difference fields the course dimension of a quantifier free type equals its transformal transcendence degree.

The proof uses a strong form of the Lang-Weil estimates and, as key ingredient to obtain equidimensional Frobenius specializations, the recent work of Dor and Hrushovski on the non-standard Frobenius acting on an algebraically closed non-trivially valued field, in particular the pure stable embeddedness of the residue difference field in this context.