

- TINGXIANG ZOU, *The Elekes-Szabó problem for cubic surfaces.*

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The Elekes-Szabó problem asks when a complex variety $V \subseteq \prod_{i=1}^3 W_i$ has unexpected large intersections with Cartesian products of finite subsets $X_i \subseteq W_i$ for $1 \leq i \leq 3$. Under the assumption that X_i 's are in *general position*, Elekes and Szabó proved that one can always find commutative algebraic groups in this scenario. We explored the case when W_i 's are a fixed cubic surface S in $\mathbb{P}^3(\mathbb{C})$ and V is the collinearity relation with the assumption that X_i does not concentrate on any one-dimensional subvarieties of S , which substantially weakens the general position assumption. We proved that when S is a smooth quadric surface union a plane, then one cannot find such X_i 's. When S is an irreducible smooth cubic surface, then X_i 's would contain a union of translates of arithmetic progressions on the family of planar cubic curves of S . But the existence of such X_i 's is still open. This is a work-in-progress joint with Martin Bays and Jan Dobrowolski.