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Some facts about very dense Sidon sets

A set S in an abelian group H is called a Sidon set if it has no non-trivial solutions to $x - y = z - w$ in S (i.e., with $\{x, w\} \neq \{y, z\}$). We say such a Sidon set is "very dense" if $|S| \geq (1 - \varepsilon)|H|^{1/2}$, i.e., close to maximum possible size.

A variety of constructions for very dense Sidon sets exists in the additive combinatorics literature, and seemingly follow no shared pattern except that they all "come from algebra".

In this talk I will explain that they fit into a common framework: they all arise from letting H act on a finite projective plane by collineations.

These ideas essentially appeared a long time ago in the design theory literature, but seem less well known in additive combinatorics, so this talk functions as a sort of public service announcement. I will also discuss some related open questions.

Joint work with Sean Eberhard.