

Haar-open sets: a right way of generalizing the Steinhaus sum theorem to non-locally compact groups.

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Let X be the countable product of Abelian locally compact Polish groups and $A, B \subset X$ be two Borel sets, which are not Haar-null in X . We prove that the sum-set $A + B = \{a + b : a \in A, b \in B\}$ is Haar-open in the sense that for any non-empty compact subset $K \subset X$ and point $p \in K$ there exists a point $x \in X$ such that the set $K \cap (A + B + x)$ is a neighborhood of p in K . This is a generalization of the classical Steinhaus Theorem (1920) to non-locally compact groups. We do not know if this generalization holds for Banach spaces.

More details can be found at (<https://arxiv.org/abs/1805.07515>).