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Rolando de Santiago* (rdesantiago@math.ucla.edu), **Ionut Chifan** and **Thomas Sinclair**.

Product Rigidity for Non-Prime Group von Neumann Algebras.

Since their inception, an important problem in the study of group von Neumann algebras is to determine which, if any, canonical properties of a group Γ remain detectable in $L(\Gamma)$, the resulting group von Neumann algebra. We begin by showing whenever Γ is a k -fold product of non-elementary hyperbolic groups and Λ is an arbitrary group such that $L(\Gamma) \cong L(\Lambda)$, then Λ is necessarily a non-trivial k -fold product of non-amenable groups $\Lambda_1, \dots, \Lambda_k$. In this case, the group von Neumann algebra retains the direct product structure of the underlying group.

Applying the techniques pioneered in the previous result to a broad collection of non-amenable AFP and poly-hyperbolic groups, we show the corresponding group von Neumann algebras exhibit a similar phenomenon. Namely, whenever Γ is a group in this class and $L(\Gamma)$ decomposes as a k -fold tensor product of II_1 factors, then Γ admits a decomposition as a non-trivial k -fold direct product of groups. This result further provides a complete classification of tensor product decomposition of these group von Neumann algebras. (Received September 12, 2017)