Discrete Locally Compact Second Countable Groups

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Let G be a non-discrete locally compact second countable group with left Haar measure μ, and Γ be a countable dense subgroup of G. Γ acts on the measure space $(G,\ \mu)$ by left translations. Let us denote the Γ-orbital equivalence relation by R_Γ.

Problem. Let G be a non-amenable as a discrete group. To which extend is G determined by equivalence relation R_Γ?

It is known that if G is compact and Γ contains a dense subgroup in G with T-property and ICC-property, R_Γ determine G with precision up to a subgroup of a finite idex (see Th.3.9 in the paper S.L.Gefter and V.Ya.Golodets, Fundamental groups for ergodic actions and actions with unit fundamental groups, Publ.RIMS, Kyoto Univ., 24(1988), 821-847).