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LIE GROUPS WITH COMPLETELY CONTINUOUS REPRESENTATIONS

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I. Let G be a separable locally compact group, and da an element of the right invariant Haar measure on G. We say that G is a CCR group if for any continuous, irreducible unitary representation T and for any complex-valued integrable function φ the operator $\int_G \varphi(a)T(a)\, da$ is completely continuous.

One of the principal results of the present note provides a characterization of all connected and simply connected CCR Lie groups (cf. Theorem 3). This extends previous results by Harish-Chandra and Auslander, Kostant and Moore obtained respectively for the semisimple and solvable case. Observe that §§II and III below are independent of each other. All Hilbert spaces occurring in our discussion will be assumed to be separable.

II. Let M be a semifinite factor and Φ a faithful, normal and semifinite trace on M (for references on this and the notions employed below cf., e.g., [3, p. 81ff.]) A positive operator A in M will be called completely continuous if, given its spectral representation $A = \int_0^{+\infty} \lambda\, dE_\lambda$, we have $\Phi(I - E_\lambda) < +\infty$ for all $\lambda > 0$. We say that A is completely continuous if and only if so is $|A|$. We write $C(M)$ for the collection of all completely continuous operators. Let G be a separable locally compact group and $\mathfrak{G}$ its group C^* algebra. We recall (cf. loc. cit.) that a factor representation T, generating M, is called normal if $T(\mathfrak{G}) \cap C(M)$ contains a nonzero operator. We shall say that G *is a* GCCR *group if for all of its normal representations we have* $T(\mathfrak{G}) \subset C(M)$.

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