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The geometric K -theory is obtained from K -cocycles (Z, ξ, f) where Z, f are as in §2 and $\xi = \{E_0 \xrightarrow{\sigma} E_1\}$ uses G -vector bundles E_0, E_1 on $T^*Z \oplus f^*T^*X$ such that the fibres of E_i are finitely generated projective modules over A . Denote this geometric K -theory by $K^*(X, G; A)$. The natural map

$$K^i(X, G; A) \rightarrow K_i[(C_0(X) \rtimes G) \otimes A]$$

is defined by using elliptic operators in the spirit of Miscenko-Fomenko [22]. We conjecture that this natural map is an isomorphism.

In the notation of Kasparov [18] the group denoted here by $K_*[C_0(X) \rtimes G]$ is $KK(\mathbf{C}, C_0(X) \rtimes G)$. For the K -homology group $KK(C_0(X) \rtimes G, \mathbf{C})$ there is a geometric group $K_*(X, G)$ which is the G -equivariant version of the topologically defined K -homology of [9]. Using transversally elliptic operators [2] one then obtains a natural map

$$K_*(X, G) \rightarrow KK(C_0(X) \rtimes G, \mathbf{C}).$$

We conjecture that this map is injective and that its image is dense (with respect to the natural topology) in $KK(C_0(X) \rtimes G, \mathbf{C})$.

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PROPOSITION 1 (A. Borel [10]). *Let G be a Lie group with $\pi_0 G$ finite and maximal compact subgroup H . If Z is any proper G -manifold then there exists a G -map from Z to $H \backslash G$.*

In §5 above this was proved for G a connected semi-simple Lie group with finite center. By the argument of §5, Borel's result implies:

COROLLARY 2. *Let G be a Lie group with $\pi_0 G$ finite. For any G -manifold X there is an isomorphism of abelian groups*

$$K_H^i(X \times (\mathfrak{h} \backslash \mathfrak{g})^*) \rightarrow K^i(X, G) \quad (i = 0, 1).$$

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