Algebraic Connections, Universal Bimodules and Entire Cyclic Cohomology

Masoud Khalkhali

Mathematisches Institut der Universität Heidelberg, Im Neuenheimer Feld 288, D-69120 Heidelberg, Germany

Abstract: A new method of constructing homotopies suitable for entire cyclic cohomology is presented. As a result, the periodic and entire cyclic cohomology of Banach algebras of finite cohomological dimension are shown to be isomorphic. The same method can be used to calculate the algebraic entire cyclic cohomology of (non-commutative) tori.

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1. Introduction

In this paper we show that for a large class of Banach algebras A, the natural map $HP^*(A) \to HE^*(A)$, from the periodic cyclic cohomology of A to the entire cyclic cohomology of A, is an isomorphism.

We prove this result assuming that there is an integer $n \geq 0$ such that for all dual Banach A-bimodules M^*, the Hochschild cohomology $H^{n+1}(A, M^*)$ vanishes. Examples of such algebras are: amenable Banach algebras ($n = 0$; see also [13] for an independent proof of this special case), and Banach algebras of finite Hochschild cohomological dimension. Note that by results of Connes [2] and Haagerup [7], a C^*-algebra is amenable if and only if it is nuclear.

Introduced by Alain Connes in [4], entire cyclic cohomology is an infinite dimensional version of cyclic cohomology and is an appropriate tool to handle index