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Cohomology of partial smash products

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Abstract

We define the partial group cohomology as the right derived functor of the functor of partial invariants, we relate this cohomology with partial derivations and with the partial augmentation ideal and we show that there exists a Grothendieck spectral sequence relating cohomology of partial smash products with partial group cohomology and algebra cohomology.

2010 MSC: 18G60, 16S35.

1 Introduction

The concept of partial group actions and representations was introduced in [7] and [12], motivated by the desire to study algebras generated by partial isometries on a Hilbert space H. More specifically, the initial motivation for introducing partial group actions in [7] was to study a certain $\mathbb{Z}$-graded algebra as a smash product with respect to a weaker form of $\mathbb{Z}$-action. This construction led to the concept of partial G-action on an algebra A, which consists of a family of ideals $\{D_g\}_{g\in G}$ of A and a family of algebra isomorphisms $\alpha_g : D_{g^{-1}} \to D_g$ satisfying some compatibilities. The associated partial skew group algebra $A \times_\alpha G$ is the k-vector space $\oplus_{g\in G} D_g$ endowed with a multiplication that resembles the one that defines a skew group algebra, and coincides with it when $D_g = A$ for every g in G. Partial representations of G appear naturally as an ingredient in the study of the representations of the partial skew group algebra $A \times_\alpha G$, see [4].

In [5] the authors expand the concept of partial smash product to that of a partial crossed product, with cocycles taking values in multiplier algebras, and this approach culminated in a characterization of the G-graded algebras

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