Central extensions of the algebra of formal pseudo-differential symbols via Hochschild (co)homology and quadratic symplectic Lie algebras

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Abstract

We describe the space of central extensions of the associative algebra Ψ_n of formal pseudo-differential symbols in $n \geq 1$ independent variables using Hochschild (co)homology groups: we prove that the first Hochschild (co)homology group $HH1(\Psi n)$ is $2n$-dimensional and we use this fact to calculate the first Lie (co)homology group $HLie1(\Psi n)$ of Ψn equipped with the Lie bracket induced by its associative algebra structure. As an application, we use our calculations to provide examples of infinite-dimensional quadratic symplectic Lie algebras.