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Twistings of Hopf algebras whose coradical is a sub-Hopf algebra

Let A be a Hopf algebra over a field of characteristic 0 with coradical H such that H is a finite dimensional sub-Hopf algebra of A. Then H is a semisimple Hopf algebra so that there is a total integral $\lambda \in H^*$ and λ is left H-linear with respect to the adjoint action of H on itself. Then there is an H-bilinear coalgebra projection π from A to H. If π is a bialgebra map, then $A \cong R\#H$, the Radford biproduct or bosonization of H with $R := A^{co\pi}$, the algebra of coinvariants. Here R is a connected Hopf algebra in the category ${}_H^H\mathcal{YD}$.

If π does not preserve multiplication, then $A \cong R\#_\xi H$ where R is a pre-bialgebra in ${}_H^H\mathcal{YD}$ and $\xi : R \otimes R \to H$. The question is whether A can be twisted by a cocycle to a Radford biproduct. We show that the correct setting for this problem is that of dual quasi-bialgebras and that A can always be twisted by a gauge transformation to a bosonization $Q\#H$ where Q is a connected dual quasi-bialgebra in ${}_H^H\mathcal{YD}$. This work is joint with A. Ardizzoni and C. Menini.