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Non-existence of integral Hopf orders for twists of simple groups of Lie type

In the papers [1] and [2] we discovered an arithmetic difference between group algebras and semisimple Hopf algebras; namely, *complex semisimple Hopf algebras may not admit integral Hopf orders.* This reveals that, unlike group algebras, Kaplansky's sixth conjecture can not be proved through the property that semisimple Hopf algebras are defined over number rings.

The families of examples for which this phenomenon occurs turn out to be simple Hopf algebras. The following question was proposed in [2]:

Let G be a finite group and Ω a non-trivial twist for $\mathbb{C}G$, arising from an abelian subgroup, such that the twisted Hopf algebra $(\mathbb{C}G)_\Omega$ is simple. Can $(\mathbb{C}G)_\Omega$ admit an integral Hopf order?

In this talk we will show that this question has a negative answer for several families of finite simple groups of Lie type, which include: special/projective special linear groups of order 2 and 3, special/projective special unitary groups of order 3, and the Suzuki groups.

The results that will be presented are part of a work in progress joint with Giovanna Carnovale and Elisabetta Masut (University of Padova, Italy).

References

[1] J. Cuadra and E. Meir, *On the existence of orders in semisimple Hopf algebras*. Trans. Amer. Math. Soc. 368 (2016), 2547-2562.

[2] ______, *Non-existence of Hopf orders for a twist of the alternating and symmetric groups*. J. London Math. Soc. (2) 100 (2019) 137-158.