Global hypoelliptic vector fields in ultradifferentiable classes and reduction to normal forms

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The global theory of differential operators is not well developed in comparison with the local theory. In particular, the characterization of global properties for vector fields on closed smooth manifolds has been studied by many mathematicians in the recent decades. The first step in this direction was taken by Greenfield and Wallach who obtained necessary and sufficient conditions for the global hypoel- lipticity of constant vector fields on tori.

Motivated by this line of research, we prove that a global ω- hypoelliptic vector field on the torus $\mathbb{T}^n$ can be reduced by a $\mathcal{E}_\omega$ diffeomorphism of $\mathbb{T}^n$ into a vector field with constant coefficients which satisfy a Diophantine condition in terms of the weight function ω. Thereby, we extend previous work in $C^\infty(\mathbb{T}^n)$ by Chen and Chi to a bigger scale of spaces, namely, in the setting of ultradifferentiable classes and ultradistributions of Beurling and Roumieu type.