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Vanishing Cohomology and the Corona Problem for the Algebra of Bounded Holomorphic Functions on the Polydisk

In this talk, we study the Corona problem for the Banach algebra $H^\infty(\mathbb{D}^n)$ of bounded holomorphic functions on the polydisk $\mathbb{D}^n \subset \mathbb{C}^n$. In this setting, the Corona problem asks whether the polydisk $\mathbb{D}^n$ is dense in the Gelfand topology in the maximal ideal space of $H^\infty(\mathbb{D}^n)$. We present new necessary and sufficient conditions under which the problem can be solved. An important part of our work is a new result on the vanishing of the first cohomology of a sheaf of germs of holomorphic functions on the n-fold Cartesian product of the maximal ideal space of $H^\infty(\mathbb{D})$. Our method is based on a new important result on the solution of special $\overline{\partial}$ equations on a polydisk. This is a joint work with Alex Brudnyi.