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Poisson Kernels and Pluriharmonic $H^2$ Functions on Homogeneous Siegel Domains

We prove that a real function $F$ defined on a homogeneous not necessarily symmetric Siegel domain satisfying an $H^2$ condition is pluriharmonic if and only if $H F = 0$, $L F = 0$, $L F = 0$, where $H$, $L$, $L$ are second order differential operators. This generalizes the result of E. Damek, A. Hulanicki, D. Müller, and M. Peloso ["Pluriharmonic $H^2$ functions on symmetric irreducible Siegel domains, Geom. Funct. Anal. 10 (2000) 1090–1117", where symmetric domains were considered. Our approach to study non-symmetric case is based on $T$-algebras introduced by E. B. Vinberg ["The theory of convex homogeneous cones, Trans. Moscow Math. Soc. 12 (1963) 340–403."]