# BOUNDEDNESS OF SINGULAR INTEGRALS IN HARDY SPACES ON SPACES OF HOMOGENEOUS TYPE

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**Abstract.** We first give a detailed proof on the coincidence between atomic Hardy spaces of Coifman and Weiss on a space of homogeneous type with those Hardy spaces on the same underlying space with the original distance replaced by the measure distance which is not equal to the original distance. Then we present some general criteria which guarantee the boundedness of considered linear operators from a Hardy space to certain Lebesgue space or Hardy space, provided that it maps all atoms into uniformly bounded elements of that Lebesgue space or Hardy space (this is not enough to guarantee the boundedness of considered linear operators which was essentially observed by Y. Meyer and further indicated by M. Bownik via the fact also observed by Y. Meyer that quasi-norms corresponding to finite and infinite atomic decompositions in Hardy spaces are not equivalent). Third, we obtain the boundedness in Hardy spaces of singular integrals with kernels only having weak regularity by characterizing these Hardy spaces with a new kind of molecules, which is deeply related to the kernels of considered singular integrals and is sharp when $p < 1$. Finally, as applications, we obtain the boundedness in Hardy spaces of singular integrals on boundaries of unbounded model domains of polynomial type in $\mathbb{C}^2$, and both Monge-Ampère singular integral operators and singular integrals with variable kernel on Euclidean spaces; and the authors also partially improve the known results on the boundedness in Hardy spaces of singular integrals with respect to an expansive matrix dilation on Euclidean spaces by requiring less regularity on their kernels.