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It is an open question if a zonoid whose dual is also a zonoid may have an  $(n-1)$ -dimensional symmetric face in dimensions 5 and higher. The existence or not of such examples is related to an isometric analogue of a theorem of Grothendieck that states that the only infinite-dimensional Banach spaces that are isometric to both a subspace of  $L^1$  and a quotient space of  $L^\infty$  are isomorphic to a Hilbert space.

Since the dual of a zonoid is an intersection body, we approach the problem from the intersection body setting. Following Koldobsky's Second Derivative Test, we prove that, in dimension 7 and higher, a direct sum of two convex bodies is not an intersection body. We also show that a non-direct sum can be an intersection body by constructing examples of intersection bodies that have an  $(n-1)$ -dimensional symmetric face. (Received February 26, 2007)