

Hyperplane equipartitions plus constraints

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While equivariant methods have seen fruitful application in geometric combinatorics, their inability to settle the long-standing topological Tverberg conjecture has made clear the need to move "beyond" the use of Borsuk-Ulam type theorems alone. Such concerns hold equally well for a variety of hyperplane mass equipartition problems tracing back to Grünbaum, in which the best known topological upper bounds nearly always exceed conjectured values arising from simple dimensional considerations. By analogy with the "constraint" method of Blagojević, Frick, and Ziegler, we show how this gap can be removed by the imposition of further conditions -- on the hyperplanes themselves (e.g., orthogonality and/or linear containment) and while including further masses and specified partition-types (e.g., cascades and/or those of a "Makeev" variety) -- thereby yielding a number of dimensional optimal results still obtainable via classical group cohomological techniques.