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Packing and covering in r -partite hypergraphs

We give the first known nontrivial upper bound (for $r > 3$) on the following old problem known as Ryser's Conjecture. For an r -partite r -uniform hypergraph H , suppose the maximum size of a matching in H is k . Does there exist a cover of H of size at most $(r - 1)k$? Here a cover is a set of vertices meeting all edges of H . It is immediate that H has a cover of size rk . We show that for the cases $r = 4$ and 5 , there exists $x > 0$ such that H has a cover of size at most $(r - x)k$. (Joint work with Alex Scott)