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Non-existence results for symmetric pair coverings with 2-regular excess.

The famous Bruck-Ryser-Chowla theorem gives necessary conditions for the existence of symmetric block designs. In this talk we present a generalization of the second part of this theorem to symmetric pair coverings which have 2-regular excess.

More precisely, a (v, k, λ) -covering is a pair (V, \mathcal{B}) , where V is a set of v points, and \mathcal{B} is a collection of k -subsets of V , called blocks, such that every unordered pair of points in V is contained in *at least* λ distinct blocks. It is called symmetric if it has equal number of blocks and points. Its excess is a multigraph on vertex set V such that an edge between two vertices $x, y \in V$ has multiplicity equal to the difference between the replication number, the number of blocks in \mathcal{B} which contain both x and y , and the index λ . We adapt arguments related to the Hasse-Minkowski invariant of the rationally congruent matrices to obtain some necessary conditions for the existence of symmetric coverings with 2-regular excess. (Received September 15, 2015)