On $m$-factorizations of complete multigraphs and finite projective spaces

The complete multigraph $\lambda K_v$ has $v$ vertices and $\lambda$ edges joining each pair of vertices. An $m$-factor of the complete multigraph $\lambda K_v$ is a set of pairwise vertex-disjoint $m$-regular subgraphs, such that these subgraphs induce a partition of the vertices. An $m$-factorization of $\lambda K_v$ is a set of pairwise edge-disjoint $m$-factors such that these $m$-factors induce a partition of the edges. If the $m$-factors are pairwise distinct, then it is called simple. Furthermore, an $m$-factorization of $\lambda K_v$ is decomposable if there exist positive integers $\lambda_1$ and $\lambda_2$ such that $\lambda_1 + \lambda_2 = \lambda$ and $\lambda K_v$ is the union of the $m$-factorizations $\lambda_1 K_v$ and $\lambda_2 K_v$, otherwise it is called indecomposable.

In this talk we will discuss simple and indecomposable $m$-factorizations of $\lambda K_v$ related to finite projective spaces for different values of $m$, $\lambda$ and $v$. 