The Lagrangian densities of r-uniform matching and linear path

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For a fixed positive integer n and an r-uniform hypergraph H, the Turán number $ex(n, H)$ is the maximum number of edges in an H-free r-uniform hypergraph on n vertices, and the Lagrangian density of H is defined as $\pi(\lambda(H)) = \sup\{r!\lambda(G) : G$ is an H-free r-uniform hypergraph$\}$, where $\lambda(G)$ is the Lagrangian of G. For an r-uniform hypergraph H on t vertices, it is clear that $\pi(\lambda(H)) \geq r!\lambda(Kt{-}1)$. Let us say that an r-uniform hypergraph H on t vertices is perfect if $\pi(\lambda(H)) = r!\lambda(Kt{-}1)$. A result of Motzkin and Straus imply that all graphs are perfect. It is interesting to explore what kind of hypergraphs are perfect. In this talk, we show that some 4-uniform matchings and 3-uniform linear paths are perfect. As an applying of Lagrangian density, we determine the Turán numbers of the extensions of those hyergraphs for large enough n, where the extension of a hypergraph is obtained by adding edges to cover the pairs of vertices not covered in the original hypergraph.