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**Ping Li** (pingli@bjtu.edu.cn), Department of Mathematics, Beijing Jiaotong University, Beijing, 100044, Peoples Rep of China, **Hong-Jian Lai\*** (hjlai@math.wvu.edu), Department of Mathematics, West Virginia University, Morgantown, WV 26506, and **Yanting Liang** (yt1814@hotmail.com), Department of Mathematics, University of Wisconsin-Fond du Lac, Fond du Lac, WI 54935. *Characterization of removable elements with respect to having  $k$  disjoint bases in a matroid.*

The well-known spanning tree packing theorem of Nash-Williams and Tutte characterizes graphs with  $k$  edge-disjoint spanning trees. Edmonds generalizes this theorem to matroids with  $k$  disjoint bases. This paper aims to determine, for a matroid  $M$  that has  $k$  disjoint bases, the set  $E_k(M)$  of elements in  $M$  such that for any element  $e$  in  $E_k(M)$ ,  $M - e$  also has  $k$  disjoint bases. Using the matroid strength defined in [Fractional arboricity, strength and principal partitions in graphs and matroids, Discrete Appl. Math. 40 (1992) 285–302], we present a characterization of  $E_k(M)$  in terms of the strength of  $M$ . Consequently, this yields a characterization of edge sets  $E_k(G)$  in a graph  $G$  with at least  $k$  edge-disjoint spanning trees such that for any edge  $e$  in  $E_k(G)$ ,  $G - e$  also has  $k$  edge-disjoint spanning trees. (Received November 24, 2012)