Co-degree condition for matchings in k-partite k-graphs

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Time: Thursday, Sep. 3rd, 15:00 - 16:00
Zoom meeting ID: 662 324 84143 Password: 121323
Link: https://zoom.com.cn/j/66232484143

Abstract: Let H be a k-partite k-graph with n vertices in each partition class, and let $\delta_{k-1}(H)$ denote the minimum co-degree of H. We characterize those H with $\delta_{k-1}(H) \geq n/2$ and with no perfect matching. As a consequence we give an affirmative answer to the following question of Rödl and Ruciński: If k is even or $n \not\equiv 2 \pmod 4$, does $\delta_{k-1}(H) \geq n/2$ imply that H has a perfect matching? We give an example indicating that it is not sufficient to impose this degree bound on only two types of $(k-1)$-sets. For near perfect matching, we gave a tight sufficient condition in term of co-degree, which is also independently obtained by Han, Zang and Zhao. Moreover, I would like to introduce several problems I am interested in.