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**Generic and topological features of flat bands in tight binding hopping models** DORON BERGMAN, Yale University, CONGJUN WU, University of California, San Diego, LEON BALENTS, University of California, Santa Barbara — We study some generic features of flat bands, that appear in a number of tight binding hopping models. Such models have recently received some attention in the literature [1,2], with a number of suggested experimental realizations. In some models the flat band touches dispersing bands at a discrete set of high-symmetry points in the Brillouin zone. In other models, the flat band is gapped. A topological argument, crucially depending on the boundary conditions of the system, is given which explains why in some models the flat band is gapped, while in others it is not. The argument is based on the observation that in flat bands in addition to quasi-local eigenstates, there invariably exist states involving non-contractible loops. In those cases where the flat band touches a dispersive band, our argument also determines at which points in momentum space this occurs. [1] C. Wu, et al., Phys. Rev. Lett. 99, 070401 (2007) [2] J. Schulenburg, et al., Phys. Rev. Lett. 88, 167207 (2002)

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