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2D Melting in General: Solid/hexatic/liquid Phase Transitions in Soft Spheres using Event-Chain Monte Carlo SEBASTIAN C. KAPFER, MANON MICHEL, WERNER KRAUTH, ENS Paris, LABORATOIRE DE PHYSIQUE STATISTIQUE TEAM — The melting of two-dimensional solids has been the subject of continued research for more than fifty years, with the prevalent scenarios being the KTHNY theory of defect unbindung and a conventional first-order liquid/solid transition. For hard disks, a rather unexpected hybrid transition has recently been found with both a first-order transition and an intermediate hexatic phase [1], while magnetic colloid experiments support the KTHNY scenario [2]. To resolve this discrepancy, we here address the melting problem for soft interaction potentials, in particular the nature of the liquid/hexatic and hexatic/solid transitions, and the defects driving melting. Simulations were performed using a new rejection-free irreversible Monte Carlo algorithm generalizing event-chain Monte Carlo to arbitrary pair potentials. In addition to fast equilibration, this algorithm permits to deduce the pressure in the NVT ensemble without any additional computations [3]. References: [1] E. P. Bernard and W. Krauth, Phys. Rev. Lett. 107, 155704 (2011). [2] P. Keim et al. Phys. Rev. Lett. 92, 215504 (2004). [3] M. Michel, S. C. Kapfer and W. Krauth, preprint at arXiv:1309.7748.

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