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Quantum coherence of Hard-Core-Bosons and Fermions: Extended, Glassy and Mott Phases ANA MARIA REY, ITAMP, Cambridge, MA,USA, INDUBALA I. SATIJA , George Mason University, FairFax, VA, USA, CHARLES W. CLARK, NIST, Gaithersburg MD, USA — Disorder has drastic effects in quantum systems of fermions and bosons. For non-interacting particles it leads to Anderson localization and to a metal-insulator transition. When interactions are present, the effects are even more drastic and the different phases induced by the interplay between disorder and interactions has been a topic of continuous theoretical interest. Cold atoms confined by a periodic lattice offer a unique laboratory to explore disordered systems in a controlled manner. I will discuss the use of Hanbury-Brown-Twiss interferometry (HBTI) to study various quantum phases of hard core bosons (HCBs) and ideal fermions confined in a one-dimensional lattice plus an additional quasi-periodic (QP) potential introduced to add pseudo-random disorder. In particular I will show the QP potential induces for HCBs a cascade of Mott-like band-insulator phases, in addition to the Mott insulator, Bose glass, and superfluid phases . The new phases are heralded by a peak to dip transition in the interferogram. On the other hand I will show that ideal fermions display various features characteristic of incommensurate structures such as devil's staircases and Arnold tongues. Finally, I will discuss why HBTI provides an effective method to distinguish Mott and glassy phases

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