LIMIT THEOREMS FOR PERTURBED PLANAR LORENTZ PROCESSES

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ABSTRACT. Modify the scatterer configuration of a planar, finite-horizon Lorentz process in a bounded domain. Sinai asked in 1981 whether for the diffusively scaled variant of the modified process convergence to Brownian motion still holds. The main result of the work answers Sinai's question in the affirmative. Other types of local perturbations are also investigated: finite horizon periodic Lorentz process in the half-strip or in the half-plane (in these models the local perturbation is the boundary condition) and finally finite horizon, periodic Lorentz process with a small, compactly supported external field in the strip. The corresponding limiting processes are Brownian motions with suitable boundary conditions and finally the skew Brownian motion on the line. The proofs combine Stroock-Varadhan's martingale method with those of our previous work. The results are joint with D. Dolgopyat and T. Varjú.