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A semi-classical analysis of Dirac fermions in 2+1 dimensions MOITRI MAITI, Univerisität Kaiserslautern, Germany, R. SHANKAR, The Institute of Mathematical Sciences, Chennai, India — We investigate the semiclassical dynamics of massless Dirac fermions in 2+1 dimensions in the presence of external electromagnetic fields. By generalizing the α matrices by two generators of the $SU(2)$ group in the $(2S+1)$ dimensional representation and doing a certain scaling, we formulate a $S \to \infty$ limit where the orbital and the spinor degrees become classical. We solve for the classical trajectories for a free particle on a cylinder and a particle in a constant magnetic field. We compare the semiclassical spectrum, obtained by Bohr-Sommerfeld quantization with the exact quantum spectrum for low values of S. For the free particle, the semiclassical spectrum is exact. For the particle in a constant magnetic field, the semiclassical spectrum reproduces all the qualitative features of the exact quantum spectrum at all S. The quantitative fit for $S = 1/2$ is reasonably good.

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