Stochastic Acceleration of Very High Energy Electrons: 
Particle Energy Distributions and Emission Spectra

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Here we investigate some aspects of stochastic acceleration of ultrarelativistic electrons by magnetic turbulence. In particular, we discuss the steady-state energy spectra of particles undergoing momentum diffusion due to resonant interactions with turbulent MHD modes, taking rigorously into account direct energy losses connected with different radiative cooling processes. For the magnetic turbulence we assume a given power spectrum of the type $W(k) \propto k^{-q}$. In contrast to the previous approaches, however, we assume a finite range of turbulent wavevectors $k$, consider a variety of turbulence spectral indexes $1 \leq q \leq 2$, and concentrate on the case of a very inefficient particle escape from the acceleration site. We find that for different cooling and injection conditions, stochastic acceleration processes tend to establish a modified ultrarelativistic Maxwellian distribution of radiating particles, with the high-energy exponential cut-off shaped by the interplay between cooling and acceleration rates. For example, if the timescale for the dominant radiative process scales with the electron momentum as $\propto p^r$, the resulting electron energy distribution is of the form $n_e(p) \propto p^2 \exp\left[-\frac{1}{a} \left(p/p_{eq}\right)^a\right]$, where $a = 2 - q - r$, and $p_{eq}$ is the equilibrium momentum defined by the balance between stochastic acceleration and energy losses timescales. We also discuss in more detail the synchrotron and inverse-Compton emission spectra produced by such an electron energy distribution, taking into account Klein-Nishina effects. We point out that the curvature of the high frequency segments of these spectra, even though being produced by the same population of electrons, may be substantially different between the synchrotron and inverse-Compton components. Several applications to astrophysical sources of high energy emission (TeV blazars in particular) are considered. This contribution is based on the results presented in [1].