Note that the magnetic damping time constant, τ_{Eddy} varies quadratically with the strength of the magnetic field at the location of the strings vibrating over the magnetic poles of the pickup (z=h). Note also that τ_{Eddy} has only a weak dependence on the frequency of vibration, f. Numerically, the above formula gives a characteristic damping time of τ_{Eddy} ~ 3-4 seconds for the strings of a typical electric guitar.

The transverse displacement, $y_n(x,t)$ of a given mode, n = 1, 2, 3, 4, ... of vibration of the guitar string, for fixed end-fixed end supports at x = 0 and x = L, with magnetic damping present is given by:

$$y_n(x,t) = y_o \exp\left(-t/\tau_{Eddy}\right)\sin(k_n x)\sin(\omega_n t)$$

Thus, magnetic damping of the strings of an electric guitar, like viscous air damping, affects the sustain of an electric guitar. The height of the pickups on an electric guitar is usually adjustable. For strings that are typically located ~ a few mm above the magnetic poles of the guitar pickups, magnetic damping of the string vibrations is not very significant - it is comparable to, or less than the damping associated with other physical processes we have discussed above. However, if the pickup height is adjusted so as to obtain the maximum possible output signal from the pickup(s), by significantly reducing the distance between the guitar strings and the magnetic poles of the pickup(s), since the decay time constant associated with magnetic damping, τ_{Eddy} depends on the square of the magnetic field strength at the strings of the guitar, $B^2(z=h)$, then magnetic damping of the string vibrations in this situation can in fact become the dominant string damping mechanism, so much so that the sustain of the electric guitar is drastically reduced, especially since the magnetic field strength, B(z) varies as ~ $1/z^3$ from the poles of the permanent magnets of the pickups.

A magnetic force, $\mathbf{F}_{Eddy}(t)$ also exists on the vibrating string, which arises due to the motionally-induced Eddy current flowing in the vibrating string of an electric guitar in the magnetic field of a pickup on the guitar.

The direction of this force is given by the so-called cross-product of the direction of the current, $I_{Eddy}(t)$ with the direction of the magnetic field intensity, B at the string. By use of the so-called "right-hand rule" associated with taking the vector cross product, $d\mathbf{F}_{Eddy}(t) = I_{Eddy}(t)\, \mathbf{dx} \times \mathbf{B}(x, z=h)$, where **dx** is along the axis of the string, in the direction of the flow of current. Thus, the direction of the instantaneous magnetic force acting on the string is always opposite to the direction of the instantaneous transverse velocity of the string, $u_y(x, t)$ - i.e. the magnetic force, $dF_{Eddy}(t)$ *opposes* the transverse motion of the vibrating string (this is simply a manifestation of Lenz's law).

Note that if the entire length of the vibrating string were immersed in a strong, uniform magnetic field, oriented perpendicular to the plane of the vibrating string, the string would experience a viscous damping force, analogous to a guitar string vibrating in a viscous fluid, such as honey! Thus, when only a small section of the guitar string in the immediate vicinity of the guitar pickup(s) is affected by this magnetic damping effect, just this small segment of the guitar string experiences this viscous magnetic damping force.