

Abstract Submitted  
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**Rotational and Vibrational Kinetic Energies Should be Included in Mass-Energy Calculations** STEWART BREKKE, Northeastern Illinois University (fomer grad student) — Conversion of mass to energy involves more than rest mass. At the subatomic, nuclear, atomic and molecular levels there are rotational, spin and vibratory kinetic energies although small may account for some discrepancies between theory and experiment. In pair annihilation spin and vibratory kinetic energies should be included in calculations. Thus,  $[E_0 = 2m_0c^2 + .5I\omega_{rp}^2 + .5\omega_{re}^2 + (n + 1/2)\hbar\omega_{vp} + (n + 1/2)\hbar\omega_{ve} + 1/2mv_p^2 + 1/2mv_e^2]$  if the positron and electron are going slowly. The  $\omega_r$  and the  $\omega_v$  are the rotational angular velocity and vibrational angular frequency. The mass energy equation for a nucleus and a molecule is therefore  $[E_0 = m_0c^2 + 1/2I\omega_r^2 + (n + 1/2)\hbar\omega_v + 1/2mv^2]$ . On a universal scale planets, stars, galaxies and galactic groups will have rotational Orbital and vibrational factors which should be included in any mass-energy conversions. Some of the energy attributed to binding energy on a nuclear level may actually be vibrational and rotational kinetic energy.

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