Relationship Between Energy, Momentum, Wavelength

Momentum (p) to classical kinetic energy (E):

$$E = \frac{p^2}{2m}$$

Energy to wavelength (De Broglie) [1]:

$$\lambda = \frac{h}{p}$$

Spherical Harmonics

Due to a spherical shaped electrical force field, we cannot just use sine waves in 1D, but we need the 3D version, spherical harmonics [1]. We see this when we compute quantum energy levels and states for the hydrogen atom [2].

Bibliography

[1] "The Schrödinger Equation." [Online]. Available: https://math.libretexts.org/Bookshelves/Differential_Equations/Differential_Equations_(Chasnov)/09%3A_Partial_Differential_Equations/9.08%3A_The_Schrodinger_Equation

[2] "The Hydrogen Atom." [Online]. Available: https://phys.libretexts.org/Bookshelves/University_Physics/University_Physics_(OpenStax)/University_Physics_III_-_Optics_and_Modern_Physics_(OpenStax)/08%3A_Atomic_Structure/8.02%3A_The_Hydrogen_Atom