

The Static String

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- ▶ Is quantum mechanics (QM) contained into string theory (ST)?
- ▶ If every result of QM can be obtained from ST, the answer is yes.

- ▶ Proposal: use semi-classical ST to study this hypothesis.

The classical oscillating string in plane 10–dimensional space,

$$t = \kappa\tau \quad r = r(\tau) \quad \text{and} \quad \phi = m\sigma$$

generates the hamiltonian,

$$H = \sqrt{\Pi^2 + m^2\lambda r^2}$$

which leads to the quantum harmonic oscillator in Schroedinger equation

$$\hat{H}^2\Psi = \frac{E^2}{\kappa^2}\Psi.$$

The classical static string, where $\dot{r} = 0$ generates the hamiltonian,

$$H = \sqrt{\Pi^2 + E_c^2}$$

where E_c is the classical energy of the string. Hence, the static string fluctuates quantumly as a free particle according to

$$\hat{\Pi}^2 \psi = \Delta E^2 \psi, \quad \text{where} \quad \Delta E^2 = \frac{E^2}{\kappa^2} - E_c^2$$

so that $\Delta E > 0$ is an oscillating solution and $\Delta E < 0$ is an evanescent solution.