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**Boundary Conditions for Open Rotating Quantum Systems**

ARTHUR DAVIDSON, Carnegie Mellon University, ECE Dept, Pittsburgh PA 15213 — The customary boundary conditions for a 1 D rotational system (e.g. a rigid rotor on a surface) are continuity of the complex wave function and its gradient. These four boundary conditions are sufficient if the potential energy satisfies rotational symmetry, but fail for non-rotational potentials. However, classical systems with a rotational coordinate and non-rotational potential are easily solved if the gradient of the potential, the force, is rotational. A solution is thus needed for Schroedinger's equation with a rotational coordinate and force, but non-rotational potential. Such solutions emerge if the boundary conditions are modified, allowing a discontinuous phase in the wave function related to the discontinuous potential energy. It will be shown that the modified boundary conditions are continuity of three real quantities: the probability density, the gradient of the probability density, and the probability current density. Moreover, with these boundary conditions and non-rotational potential, energy can flow both ways between the system and its environment. The discontinuous wave functions obey the new boundary conditions, but nonetheless are not generally superposable. A subset of the discontinuous wave functions can be superposed, however, yielding the usual result for angular momentum states. The non-superposable wave functions offer an alternate interpretation of the Schroedinger's cat paradox.

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