1116-81-983 **Phillip R. Dukes*** (phillip.dukes@utrgv.edu), Phillip R. Dukes, University of Texas Rio Grande Valley, Brownsville, TX 78520. *Continuous-time quantum walks over simply connected graphs, amplitudes and invariants.*

We examine the time dependent amplitude $\phi_i(t)$ at each vertex i of a CTQW on a variety of simply connected graphs. The Lissajous curve of the real vs. imaginary parts of each $\phi_i(t)$ reveals interesting shapes of the space of time-accessible amplitudes. We find two invariants of CTQW's. First, considering the rate at which each amplitude evolves in time the quantity $T = \sum_{i=0}^{n-1} |\frac{d\phi_i(t)}{dt}|^2$ is time invariant. The value of T for any initial state can be minimized with respect to a global phase factor $e^{i\theta t}$ to some value T_{min}. An operator for T_{min} is defined. For any simply connected graph g the highest possible value of T_{min} with respect to the initial state is found to be $T_{min}^{max} = \left(\frac{\lambda_{max}}{2}\right)^2$ where λ_{max} is the maximum eigenvalue in the spectrum of g. A second invariant is found in the time-dependent probability distribution $P_i(t) = |\phi_i(t)|^2$ of any initial state satisfying T_{min}^{max}, with these conditions $\sum_{i=0}^{n-1} \left(P_i^{max} - P_i^{min}\right)^2 = \frac{4}{n}$ for all simply connected graphs of n vertices. (Received September 16, 2015)