1145-81-2575 **Alexander K Wiedemann*** (akw@math.sc.edu) and **George Androulakis**. *GKSL Generators and Digraphs: Computing Invariant States.*

In recent years, digraph induced generators of quantum dynamical semigroups have been introduced and studied, particularly in the context of unique relaxation. In this talk we consider a general class to which these generators belong which allows for additional interaction coefficients but still preserve their main structural properties. To this end we provide a characterization of when the Gorini-Kossakowski-Sudarshan-Lindblad (GKSL) equation defines a proper generator when allowed arbitrary Lindblad operators (in particular, they need not be traceless as demanded by the GKSL Theorem(s)).

Within this general class, when the basis of the underlying Hilbert space is given by the eigenbasis of the Hamiltonian, e.g. the generic semigroups, we explicitly compute all invariant states of the semigroup; further, given the digraph's (Laplacian) eigenvalues, one can also explicitly compute all eigenvalues of the semigroup, and thereby recover exact rates of relaxation.

Finally, we consider the converse construction to show that every generator naturally gives rise to a digraph, and that under certain assumptions the properties of this digraph can be exploited to gain knowledge of both the number and the structure of the invariant states of the corresponding semigroup. (Received September 25, 2018)