Non–Hermitian Dynamics

F. Masillo,[1] G. Scolarici,[2] L. Solombrino[1 3] and S. Sozzo[1 3]

[1]Dipartimento di Fisica, Università del Salento, Italy

[2]Department of Mathematics, Koc University

[3]Istituto Nazionale di Fisica Nucleare, Sez. di Lecce, Italy

The subgroup mainly concerned with non-Hermitian dynamics analyzed some features of alternative Hermitian and quasi–Hermitian quantum descriptions of simple, bipartite and multipartite compound systems (in the finite and in the infinite dimensional case). It was shown that alternative descriptions of N interacting subsystems are possible if and only if the metric operator of the compound system can be obtained as a tensor product of positive operators on component spaces [1,2]. Moreover, the capability of entanglement was also considered for these formulations in term of von Neumann entropy associated with subsystems [1,3]. Furthermore, some complex stochastic maps arising in this context was characterized to be the complex projection of quasianti–Hermitian quaternionic dynamics [4]. Finally, von Neumann entropy preserving positive maps are under investigation.

The subgroup has also started a joint research with the subgroup concerned with the *Foundations of Quantum Mechanics* on the *subentity problem* in QM. It has been proven that, if one adopts the general formulation of QM on quaternionic Hilbert spaces, proper and improper mixtures can be represented by different kinds of density operators. This representation is compatible with the different evolutions of the two kinds of mixtures in complex QM, hence it allows one to distinguish proper from improper mixtures not only from an interpretative but also from a mathematical point of view, which does not occur in standard QM [6].

REFERENCES

1. G. Scolarici and L. Solombrino, "Alternative descriptions and bipartite compound quantum systems", J. Phys. A 42 (2009) 055303.
2. F. Masillo, G. Scolarici and L. Solombrino, "Alternative descriptions and multipartite compound quantum systems" (2009). Submitted to J. Math. Phys.
3. G. Scolarici, "Remarks on alternative Hermitian structures for composite quantum systems" (2008). In print in Theor. Math. Phys.
4. G. Scolarici and L. Solombrino, "Quasistationary quaternionic Hamiltonians and complex stochastic maps", J. Phys. A 41 (2008) 244024.
5. G. Marmo, G. Scolarici, A. Simoni and F. Ventriglia, "Remarks on unitary representations of Lie groups in the geometrical formulation of quantum mechanics".
6. F. Masillo, G. Scolarici and S. Sozzo, "Proper versus improper mixtures: towards a quaternionic quantum mechanics", ArXiv: 0901.0795v1 [quant-ph] (2008). In print in Theor. Math. Phys.