UNCERTAINTY RELATIONS IN PRE- AND POST-SELECTED SYSTEMS

Everyone is cordially invited to attend

Professor

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Organized by

Physics & Applied Mathematics Unit (PAMU)

ABSTRACT

Robertson-Heisenberg like uncertainty relation is derived for two incompatible observables in a pre- and post-selected (PPS) quantum system which can express the impossibility of jointly sharp preparation of pre- and post-selected quantum states for measuring those observables. Motivated by the fact that when the post-selected state is same as the pre-selected state, PPS system turns to be a standard system and we take this as our basis of the derivation for the PPS system based standard deviation (uncertainty). We provide here physical interpretations of the newly defined standard deviation and the uncertainty relation in the PPS system. It is shown that joint sharp preparation of a quantum state for non-commuting observables is possible when the standard system is transformed into a PPS system with certain conditions, an impossible task in standard system. Some applications of uncertainty and uncertainty relation in the PPS system are provided here: (i) Detection of mixedness of the given pre-selection using two different definitions of the PPS system based standard deviation, (ii) stronger uncertainty relation in the standard system using the uncertainty relation in the PPS system, (iii) genuine quantum mechanical uncertainty relation can be found using the first definition of uncertainty when the pre-selection is a mixed state, (iv) state dependent tight uncertainty relation in the standard system, and (v) tight upper bound for the out-of-time-order correlation function.

Signature of Head, PAMU