From Quantum to Classical, by Numbers

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ABSTRACT

In quantum mechanics, certain quantities are not allowed to have well defined simultaneous values. Such are the components of a spin along non-collinear axes, or the position and momentum of a point particle. An attempt to measure one of these quantities inevitably perturbs the system's state, and modifies the result of measurement of the other. In the classical limit of the theory, the situation is different. All components of a large angular momentum have well defined values, and a particle is endowed with a position and the velocity, at the same time. The question of how this limit is reached, is currently a subject of an ongoing discussion. Here we look at the problem from the point of view of quantum measurement theory. We examine a simple model, in which a classical picture is recovered for large composite bodies, provided the Observer performs observations of only "collective variables" [1], and to a finite accuracy only.

REFERENCES

[1] Lloyd, S. and Slotine, J.-J.E. Quantum feedback with weak measureaments, *Phys. Rev. A.* (1994) **37**:01237 1–5