Reality, measurement and locality in Quantum Field Theory

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Abstract

It is currently believed that the local causality of Quantum Field Theory (QFT) is destroyed by the measurement process. This belief is also based on the Einstein-Podolsky-Rosen (EPR) paradox and on the so-called Bell's theorem, that are thought to prove the existence of a mysterious, instantaneous action between distant measurements. However, I have shown recently that the EPR argument is removed, in an interpretation-independent way, by taking into account the fact that the Standard Model of Particle Physics prevents the production of entangled states with a definite number of particles. This result is used here to argue in favor of a statistical interpretation of QFT and to show that it allows for a full reconciliation with locality and causality. Within such an interpretation, as Ballentine and Jarret pointed out long ago, Bell's theorem does not demonstrate any nonlocality.

Keywords:	Quantum Field Theory; Standard Model; Correlations; Locality; Causality; Measurement Problem; Einstein-Podolsky-Rosen paradox; Bell's Theorem
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