Value Reproducibility and Intersubjectivity of Quantum Measurements based on Quantum Perfect Correlations

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Suppose that two observers simultaneously measure the same observable. We ask whether they always obtain the same outcome, or their probability distributions are the same but the outcomes are uncorrelated. Contrary to the widespread view in favor of the second, we show that quantum mechanics predicts that only the first case occurs. This suggests the existence of the perfect correlation between the measurement outcome and the pre-existing value of the measured observable. In fact, we show that any measurement establishes a time-lik entanglement between the observable to be measured and the meter after the measurement, which causes the space-like entanglement between the meters of different observers, and hence every meter shows the same measurement outcome. We also argue that our conclusion cannot be extended to measurements of so-called "generalized" or "unsharp" observables, suggesting that conventional observables with projection-valued measures represent the system's physical reality, but "generalized" or "unsharp" observables with non-projective POVMs represent only the statistical property of the measuring apparatuses.

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