Probing Contextuality with Pre- and Post-selection

JEFF TOL-LAKSEN, Center for Quantum Studies, Department of Physics and Department of Computational and Data Sciences, College of Science, George Mason University —

By analyzing the concept of contextuality (Bell-Kochen-Specker) in terms of pre-and-post-selection (PPS), it is possible to assign definite values to observables in a new way. Physical reasons are presented for restrictions on these assignments. When measurements are performed which do not disturb the pre- and post-selection (i.e. weak measurements), then novel experimental aspects of contextuality can be demonstrated including a proof that every PPS-paradox with definite predictions implies contextuality. Certain results of these measurements (eccentric weak values with e.g. negative values outside the spectrum), however, cannot be explained by a “classical-like” hidden variable theory. Surprising theoretical implications are discussed.

Jeff Tollaksen
Center for Quantum Studies, Department of Physics and Department of Computational and Data Sciences, College of Science, George Mason University

Date submitted: 16 Nov 2006