Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Mermin inequalities for GHZ contradictions in many-qutrit systems WALTER LAWRENCE, Dartmouth College and University of Chicago — In view of recent experimental interest [1] in multi-qutrit entanglement properties, we provide here new Mermin inequalities for use in experimental tests of many-qutrit GHZ contradictions, first predicted only recently (2013). Mermin inequalities refer here to Bell-like inequalities in which the quantum predictions are not probabilistic, thus elevating hidden variables to the status of EPR elements of reality. Earlier Bell inequalities for qutrits [2] predate the discovery of GHZ contradictions, are based on non-concurrent observable sets, and hence cannot establish GHZ contradictions. The current Mermin inequalities are derived from those concurrent observable sets which produce GHZ contradictions, with the following results: (i) There is an operator M defined for every $N \geq 4$, built on two measurement bases, whose quantum eigenvalue grows as 2^N, maximum classical value more slowly (1.879^N), with quantum to classical ratio being never less than 1.39, and (ii) For $N = 3$, there is an M_3, built on three local measurement bases, whose quantum to classical ratio is 3/2. [1] M. Malik et. al., *Nature Photonics*, **10**, 248 (2016), [2] W. Son et. al., *Phys Rev. Letters*, **96**, 060406 (2006).

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Date submitted: 11 Nov 2016 Electronic form version 1.4