In a recent Letter \cite{1}, Cuccoli et al presented a new theoretical approach to the understanding of the two dimensional (2D) quantum Heisenberg antiferromagnet (QHA). The approach is characterized by the feasibility of the separation of the quantum fluctuation from the thermal one. One of their main predictions is that ξ for the QHA is given by that of the classical counterpart, i.e.,

\[ \xi(t) = \xi_{cl}(t_{cl}), \quad t_{cl} = t/\theta^4(t), \]  

where \( t = kT/J \) for \( S = 1/2 \) and \( \theta(t) \) can be determined from their theory using their Eqs.(6)-(8), at least numerically.

The authors concluded that their theory “appears to explain all the experimental data for different values of \( S \) without any fitting parameters”. Consequently, they questioned the validity of the key assumption of the conventional theoretical approach \cite{2}. This conclusion, however, is surprising because the Gaussian approximation they used to handle the quantum fluctuation is supposed to be accurate only when the effect of the fluctuation is weak, i.e., for sufficiently large value of \( S \) and high temperature. Since the experimental data have rather large statistical fluctuation and previously available MC data limited to \( \xi < 30 \) are not completely free of systematic errors, much more accurate data including larger \( \xi \) appear to be crucial to check the validity of their theory.

In this Comment we present high precision MC data of the second moment correlation length for \( L/\xi > 21 \). We thus conclude that the validity of the new approach is limited to very high temperature regime, i.e., \( T/J > 0.4 \) for the 2D \( S = 1/2 \) QHA.

We would like to thank A. Cuccoli, V. Tognetti, R. Vaia and P. Verrucchi for helpful comments and for sending us their numerical estimates for the function \( \theta^4 \).

Jae-Kwon Kim\textsuperscript{a}, D. P. Landau\textsuperscript{a}, and Matthias Troyer\textsuperscript{b}

\textsuperscript{a}Center for Simulational Physics
The University of Georgia, Athens, GA 30602
\textsuperscript{b}Institute for Solid State Physics
University of Tokyo, Tokyo 106, Japan

\textbf{Figure Caption:} Comparison of the Monte Carlo data with the theoretical prediction Eq.(1) for the 2D \( S = 1/2 \) QHA. The statistical errors of our data are much smaller than the size of the symbol.

\begin{thebibliography}{9}
\bibitem{1} A. Cuccoli, V. Tognetti, R. Vaia, and P. Verrucchi, Phys. Rev. Lett. \textbf{77}, 3439 (1996)
\bibitem{2} S. Chakravarty \textit{et al}, Phys. Rev. B \textbf{39}, 2344 (1989)
\bibitem{3} B. B. Beard and U.-J. Wiese, Phys. Rev. Lett. \textbf{77}, 5130 (1996)
\bibitem{4} J. Apostolakis \textit{et al}., Phys. Rev. D \textbf{43}, 2687 (1991); J.-K. Kim, Phys. Rev. D \textbf{50}, 4663 (1994); S. Caracciolo \textit{et al}., Phys. Rev. Lett. \textbf{75}, 1891 (1995)
\bibitem{5} M. S. Makivic and H.-Q. Ding, Phys. Rev. B \textbf{43}, 3562 (1991)
\end{thebibliography}
