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An Effective Series Expansion to the Equation of State of Unitary Fermi Gases THEJA DE SILVA, Augusta University — Using universal properties and a basic statistical mechanical approach, we propose an effective series expansion to the equation of state for unitary Fermi gases. The universal equation of state is written as a series solution to a self-consistent integral equation where the general solution is a linear combination of Fermi functions. First, by truncating our series solution to four terms with already known exact theoretical inputs at limiting cases, namely the first *three* virial coefficients and using the Bertsch parameter as a free parameter, we find a good agreement with experimental measurements in the entire temperature region in the normal state. This analytical equation of state agrees with experimental data up to the fugacity $z = 18$, which is a vast improvement over the other analytical equations of state available where the agreements is only up to $z \approx 7$. Second, by truncating our series solution to four terms using first *four* virial coefficients, we find the Bertsch parameter $\xi = 0.35$, which is in good agreement with the direct experimental measurement of $\xi = 0.37$. This second form of equation of state shows a good agreement with self-consistent T-matrix calculations in the normal phase.

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