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Qingyang Zhang* (qyy816321@outlook.com), 1920 South 3rd street, Unit #39, Waco, TX 76706, and **Shuhuang Xiang** (xiangsh@csu.edu.cn), School of Mathematics and Statistics, Central South University, No.932 South Lushan Road, Changsha, Hunan 410083, Peoples Rep of China. *On fast multipole methods for Volterra integral equations with highly oscillatory kernels.*

This paper explores the fast multipole methods (FMMs) to accelerate the approximation for weakly singular Volterra integral equations with highly oscillatory trigonometric kernels. By constructing the fast translation path, the FMM is utilized to speed up the iterative method, which reduces the complexity from $O(N^2)$ to $O(N)$. Especially, we use the collocation method to discretize the Volterra integral equation with constants and linear elements respectively, then apply the GMRES to solve the dense and non-symmetric linear system. In addition, the highly oscillatory integrals derived from the algorithm are calculated effectively by the steepest descent method. The proposed method shows that the numerical solutions become more accurate as the frequency increases. Both of the optimal convergence rates of truncation and the error bounds analysis are represented in the end. (Received September 21, 2018)