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AIM结合渐近波形估计技术快速分析目标宽带电磁散射特性

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Fast Analysis of Electromagnetic Scattering of Targets over a Broad Frequency Band Using AIM with Asymptotic Waveform Evaluation

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摘要 该文将自适应积分方法(AIM)与渐近波形估计(AWE)技术结合快速计算了目标宽带雷达截面(RCS)。通过渐近波形技术实现快速扫频，利用自适应积分(AIM)稀疏存储稠密阻抗矩阵及阻抗矩阵的频率导数，并加速求解泰勒展开系数中的矩阵与矢量相乘计算，提高了计算速度并降低了内存需求。通过结合自动微分技术，计算了该方法所需的格林函数关于频率的高阶导数。数值结果表明，与传统AIM逐点计算相比，该方法在不失精度条件下大大地降低了计算时间。

关键词： 电磁散射　自适应积分　快速傅里叶变换　矩量法　渐近波形估计　雷达截面

Abstract： The Adaptive Integral Method (AIM) in conjunction with the Asymptotic Waveform Evaluation (AWE) technique is presented for fast Radar Cross Section (RCS) calculation of arbitrarily shaped perfect electric conductor targets over a broad frequency band. The application of AWE enables fast frequency sweep analysis. The AIM is employed to reduce the matrix storage and to accelerate the matrix-vector multiplications in the solutions of the Taylor coefficients, the computational rate is improved and the memory requirement is reduced. Combining with Automatic Differentiation (AD) technique, the high order frequency derivatives of Green' s function required in the hybrid method are calculated. The numerical results presented in this paper are compared with the results obtained by the conventional AIM point-by-point calculations. The proposed hybrid technique can greatly reduce the computation time without loss of accuracy.

Keywords： Eletromagnetic scattering　Adaptive Integral Method (AIM)　FFT　Method of Moments (MoM)　Asymptotic Waveform Evaluation (AWE)　Radar Cross Section (RCS)

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