电网技术 2011, 35(3) 159-164 DOI: ISSN: 1000-3673 CN: 11-2410/TM

高电压技术

高压输电导线三维工频电磁场计算与测量

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摘要：

为准确计算高压输电线路以及交叉跨越输电线路的工频电磁场，基于模拟电荷法和毕奥-萨瓦定律，根据悬链线方程建立了输电导线的三维电磁场通用计算模型。计算和测量了常规同塔双回线路以及交叉跨越导线下方的工频电磁场分布，结果表明，在垂直档距中央的横向分布上，三维模型计算结果与二维模型导线计算高度取最小对地高度时的计算结果十分接近，且均与实测值比较吻合；交叉跨越导线下方交叉点投影位置，工频电磁场计算值与测量值也吻合较好，验证了交叉跨越导线计算模型的有效性。此外，分析了导线下方工频电磁场计算值与测量值的误差来源，着重讨论了影响三维计算模型计算结果的相关因素，给出了导体线单元剖分段数的合理值。

关键词：

Calculation and Measurement of Three-Dimensional Power Frequency Electrical and Magnetic Field Under Transmission Line

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Abstract:

To calculate power frequency electric and magnetic fields (PFEMF) generated by high voltage transmission line or space-crossing transmission lines accurately, based on charge simulation method (CSM) and Biot-Savart theorem, a universal model to calculate three dimensional PFEMF is built according to catenary equation, then the distribution of PFEMF under ordinary 330 kV double circuit transmission line on the same tower and that under the crossing transmission lines are calculated and measured. Calculation and measurement results show that as for the transverse distribution of PFEMF along the measured points perpendicular to the midspan, the results calculated by three-dimensional model under the calculation height of the conductor that is chosen as the minimum height above ground are very close to those calculated by two-dimensional model and are close to the measured results as well; at the projection beneath the crossing point of crossing transmission lines, the calculation results of PFEMF are close to the measured results, thus the effectiveness of the proposed calculation model of crossing transmission lines is verified. The causes leading to the error between the calculation results of PFEMF and its measured results are analyzed, and related factors influencing the calculation results by three-dimensional calculation model are emphatically discussed, and the reasonable number of divided conductor segments is given.

Keywords:

收稿日期 2010-07-15 **修回日期** 2010-11-25 **网络版发布日期** 2011-03-11

DOI:

基金项目:

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