物理

长中子计数管探测效率的模拟

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摘要　　为获得较高的探测效率且在较大范围内对中子有比较平坦的能量响应曲线，用蒙特卡罗程序研究了聚乙烯慢化体结构对BF3长正比计数管的中子探测效率的影响。模拟结果表明，增大慢化体半径可增加计数管探测效率，调节计数管前端慢化体厚度可改善能量响应曲线高能部分的平坦度。另外，利用建立的模型计算了1套现有的长硼计数器对D-D(2.4 MeV)及D-T(14.1 MeV)中子的相对探测效率。模拟结果为探测系统对D-D中子的探测效率为对D-T中子的75％，而加速器标定的实验结果为61％。两者可认为是近似一致的，这从实验上验证了模拟模型的可靠性。

关键词　 蒙特卡罗模拟；慢化体；长中子计数管

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Efficiency Simulation of Long Neutron Counter

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Abstract In order to achieve the high efficiency and uniform sensitivity for neutrons with widely different energies, the efficiency of long boron trifluoride proportional counter imbedded in polyethylene moderator was simulated by MCNP code. The result shows that detective efficiency would increase with increasing moderator radius and response curve at higher energy would be ameliorated through adjusting the thickness of front moderator. Also we calculated the relative efficiencies for different energy of a detector whose efficiencies were calibrated on an accelerator. The simulated efficiency for D-D neutrons (2.4 MeV) is 75% of the efficiency for D-T neutrons (14.1 MeV), which is approximately agreed with experimental data, 61%. The validity of the simulated model was proved by the consistent results between calculation and experiment data.

Key words Monte-Carlo simulation _ moderator _ long neutron counter

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