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应用于机械速度选择器校准的中子飞行时间谱仪研制

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中国先进研究堆小角中子散射谱仪位于中子导管大厅，安装在冷源导管出口处。机械速度选择器是小角中子散射谱仪关键部件，其将导管传送的白光中子束单色成中子散射实验需要的波长 λ，分辨 Δλ/λ(FWHM) 的单色中子束。应用于机械速度选择器校准的中子飞行时间谱仪是测量单色中子束波长 λ 和分辨 Δλ/λ(FWHM) 的实验装置；测量结果指导机械速度选择器调节。介绍了谱仪的结构和谱仪关键部件的参数选择，阐述了谱仪探测系统设计。由于高注量率引起中子探测器瞬时计数率高漏计数多测量结果精度差，为了将漏计数限制在 0.5% 以内，针对高瞬时计数率提出了一套理论分析方法，得出各个探测器的计数率上限。

Small angle neutron spectrometer on China Advanced Research Reactor (CARR) is located at neutron guide hall and is installed on the end of cold neutron guide. Velocity selector which can purify white light neutron beam into monochromatic neutron beam with wavelength λ and resolution Δλ/λ (FWHM) which satisfy the demand of neutron scattering experiments is its key component. Neutron time of flight spectrometer for velocity selector calibration is an experiment apparatus which is used for wavelength and resolution measurements of monochromatic neutron beam. According to the measurement results, the rotating speed and tilt angle of velocity selector are adjusted until specific wavelength and resolution decided by physics experiment are acquired. Spectrometer structure and selected parameters of its key components are introduced. Its detection system is described. The high fluence rate of monochromatic neutron beam leads to high count rate in a short time, high count loss and poor data precision. In order to reduce the number of suppressed pulses to be less than 0.5% of the number of total pulses, a method of theoretical analysis is put forward for high count rate in a short while and the upper limit of count rate for each detector is acquired.

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