MUON CAPTURE IN DEUTERON

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As the major experimental effort to extract the neutron-neutron scattering length a_{nn} from a $\mu^- d \to nn\nu_\mu$ kinematically complete experiment is to be made [1] the attention has been paid to examine the role of neutron--neutron off-energy-shell uncertainties which might preclude the extraction of a_{nn}. We have analysed how the different phase equivalent potentials influence the kinematically complete neutron spectrum which is found to be the most sensitive to variation of a_{nn} [2]. The influence is found to be enough important to introduce the ambiguities in the extraction of a_{nn}. The off-shell dependence of the total capture rate was also found to be remarkable. This offers the possibility of restricting the off-shell uncertainties in capture rate spectrum by demanding that the theoretical value of the total capture rate should be within the experimental uncertainties. Thus we found that the off-shell uncertainty in the determination of a_{nn} for the 0^0 relative n-n angle and 15% arbitraryness in the doublet capture rate is somewhat less than ± 1 fm. The analysis has shown that the decrease of percentage of arbitrareness in the capture rate enables the reduction of the corresponding uncertainty in a_{nn}. However, as the nn angle is increased the introduced uncertainty in a_{nn} tends to be larger.

References

[1] Breunlich, W.H. et all.: SIN Phys. Rep. No 2, 29 (Dec. 1977)

[2] Švarc, A., Bajzer, Ž., Furić, M.: Z. Physik A285 (1978) 133