Spiral phases in frustrated quasi-one-dimensional quantum spin systems

We consider ground-state properties of quasi-1-dimensional quantum Heisenberg antiferromagnets for spin quantum numbers $s = \frac{1}{2}$ and $s = 1$. For the investigation of the ground-state long-range order we calculate the sublattice magnetization using the high order coupled cluster method. We find that for the unfrustrated spin-$\frac{1}{2}$ system an infinitesimal inter-chain coupling $J_\perp$ is sufficient to stabilize magnetic long-range order. This result is in agreement with known results obtained by other methods. For $s = 1$ we find that a finite inter-chain coupling is necessary to stabilize magnetic long-range order, which can be interpreted as a result of the gapped ground-state of the spin-1 chain. The estimated value for the critical inter-chain coupling is: $J_\perp^c \approx 0.1$. Furthermore we consider a spin-$\frac{1}{2}$ system were a frustrating next-nearest neighbor in-chain coupling is included. We find for strong frustration that again a finite inter-chain coupling $J_\perp$ is necessary to stabilize long-range order.