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Monte Carlo studies of spinon deconfinement in two dimensions[1]

YING TANG, ANDERS SANDVIK, Boston University — We have used a recently proposed quantum Monte Carlo algorithm [1] to study spinons (emergent $S = 1/2$ excitations) in 2D Resonating-Valence-Bond (RVB) spin liquids and in a J-Q model hosting a Néel–VBS phase transition at zero temperature. We found that spinons are well defined quasi-particles with finite intrinsic size in the RVB spin liquid. The distance distribution between two spinons show signatures of deconfinement. However, at the Néel–VBS transition, we found that the spinon size itself is comparable to the confinement length (the size of the bound state), even showing a shrinkage of the bound state (triplon) relative to the single spinon. Both the spinon size and the confinement length diverge as the critical point is approached. We attempt to extract the corresponding exponent. [1] Y. Tang and A. W. Sandvik, Phys. Rev. Lett. **107**, 157201 (2011).

[1]DMR-1104708

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