**Referee's report**

In the present manuscript the authors attempt to tackle a (at least) three decades old problem of hole pairing in quantum antiferromagnets. They consider the $t-J$ and $t-J_z$ models and study the role of Brinkman-Rice strings in the pairing mechanism. The idea that holes in quantum antiferromagnets bind through the strings has been examined by a few authors in the past where it was found that $d_{x^2-y^2}$ pairing is favored in this case. It is clear that the present paper is solid work and sheds additional light in this problem. Using an effective model of partons connected by a confining string they calculate the spectral properties of bound states.

I have only one comment for the authors' consideration which is not a condition for publication. This work as some others (especially within the $t-J_z$ model) predict heavy states of immobile pairs with flat-band dispersions. However, it is well-known that quantum spin-fluctuations erase the origin of the string to which each hole is attached, through a pair of hole-hoppings with an additional spin-pair flip. This mechanism is the one which gives rise to a finite bandwidth to the single-hole dispersion, i.e., of the order of $t^2/J$ in the $t-J$ model. This mechanism allows the holes to keep their kinetic energy low while bound to one-another which opens the door for bound-states of mobile pairs.

In conclusion, I believe that the present work is a significant contribution to this important outstanding problem and I strongly recommend publication of the paper in its present form.