

# AD\_Excitation

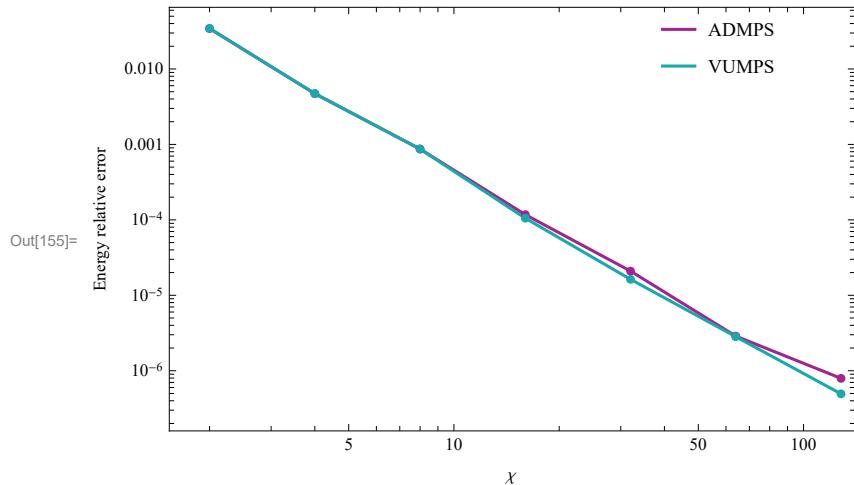
## 1D ground state

useful function

Heisenberg

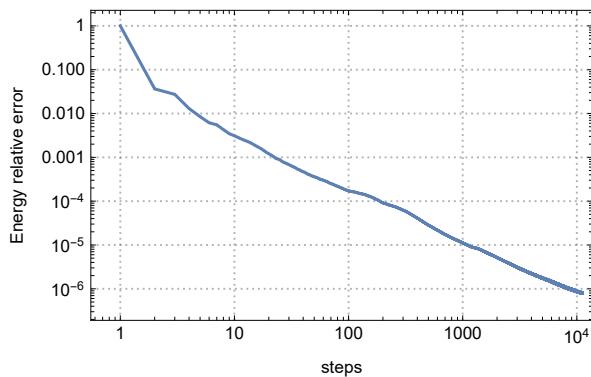
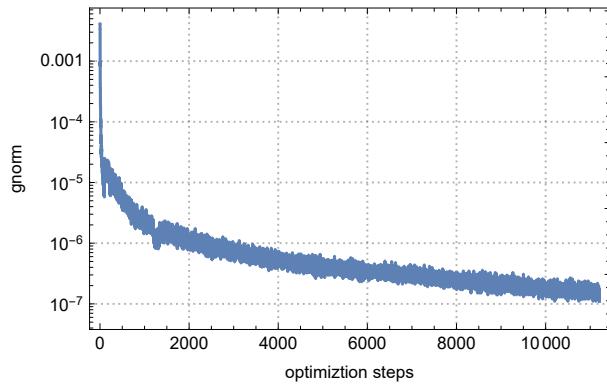
relative error- $\chi$

error exponentially-dependent on  $\chi$



relative error-steps

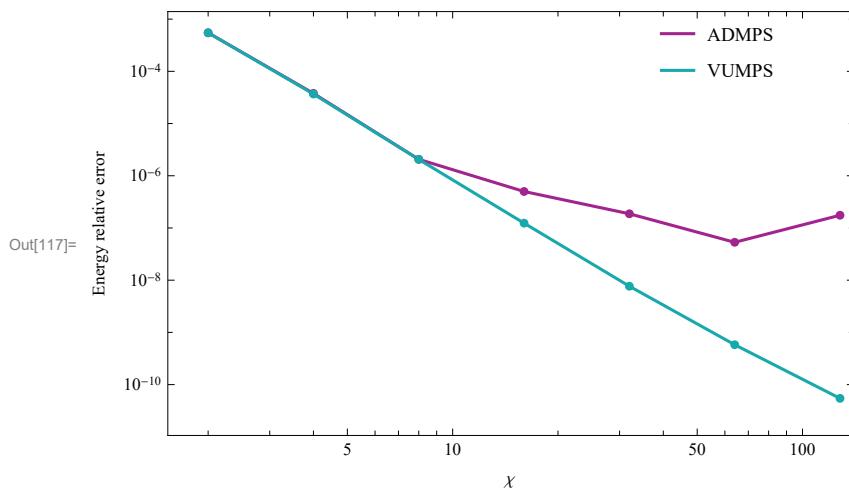
error exponentially-dependent on steps

E-steps  $\chi=128$ Out[ $\#$ ]=gnrom-steps  $\chi=128$ 

## TFIsing at critical point $g=1$

relative error- $\chi$

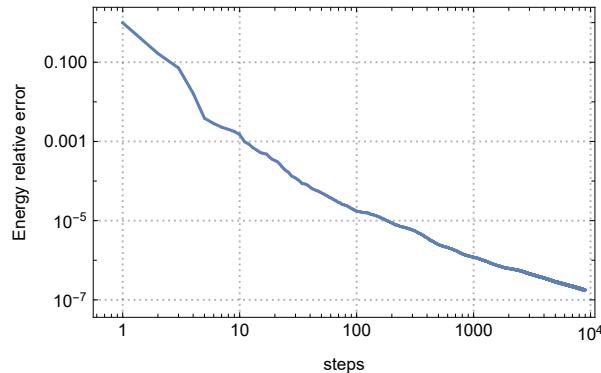
error exponentially-dependent on  $\chi$



## relative error-steps

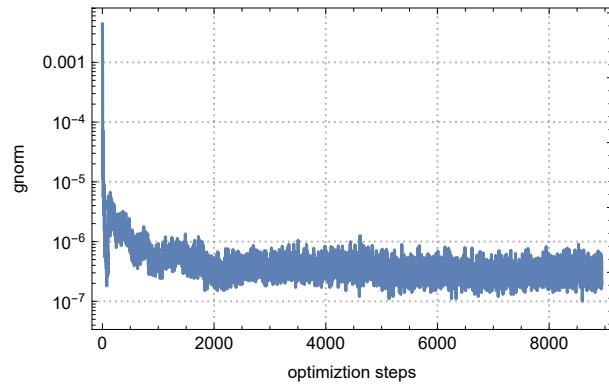
error exponentially-dependent on steps

E-steps  $\chi=128$



Out[ ]=

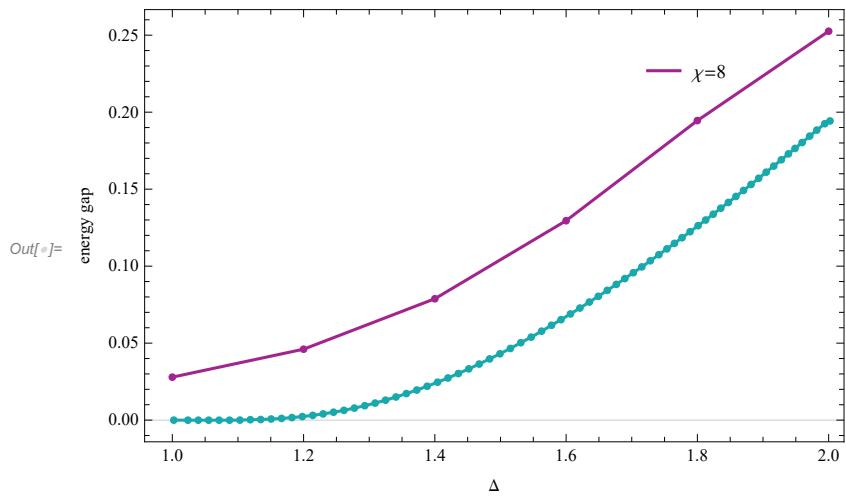
gnorm-steps  $\chi=128$



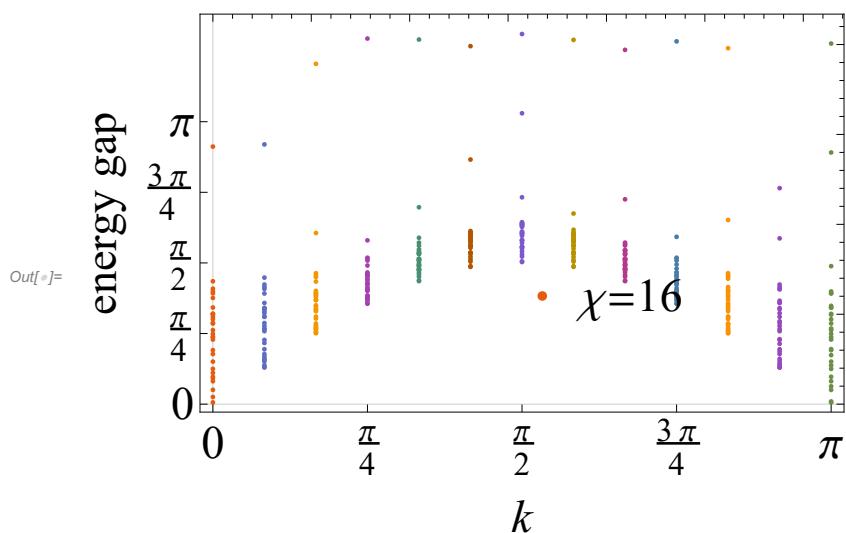
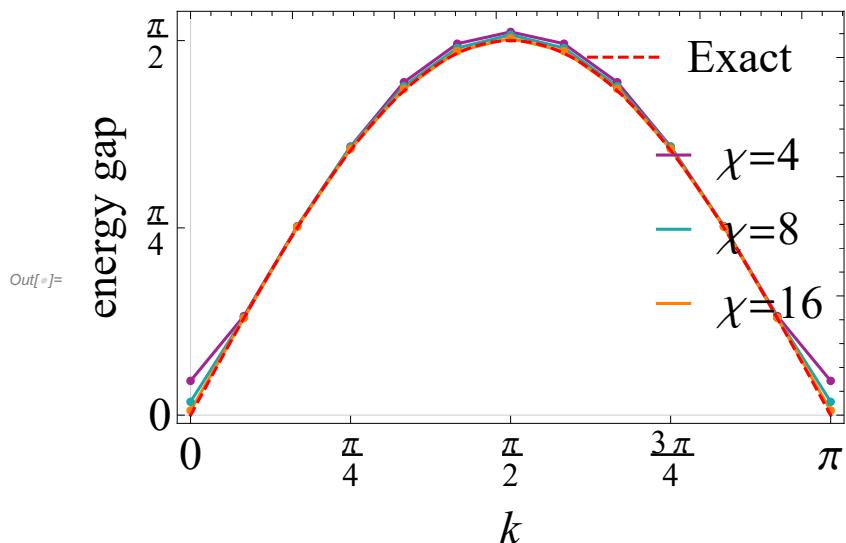
## 1D Excitation

### U1

## XXZ $\Delta=1$

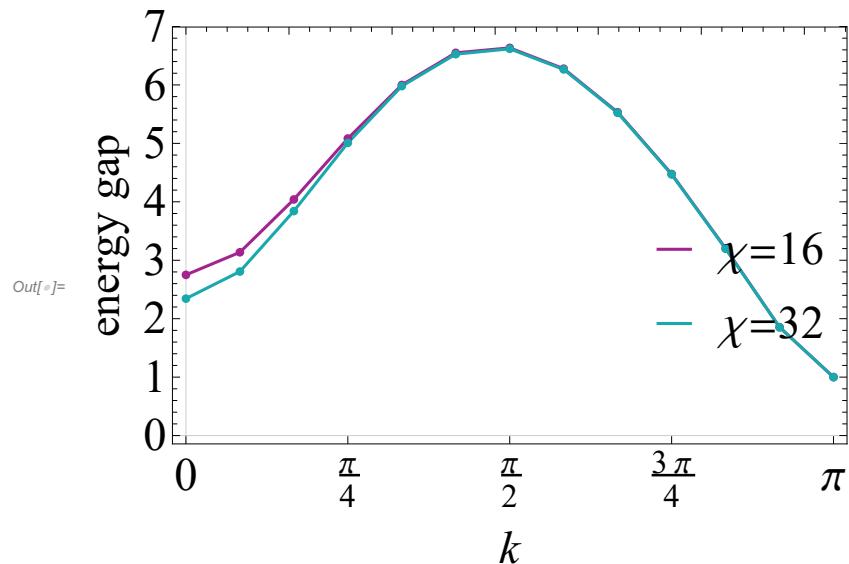


## Heisenberg S=1/2

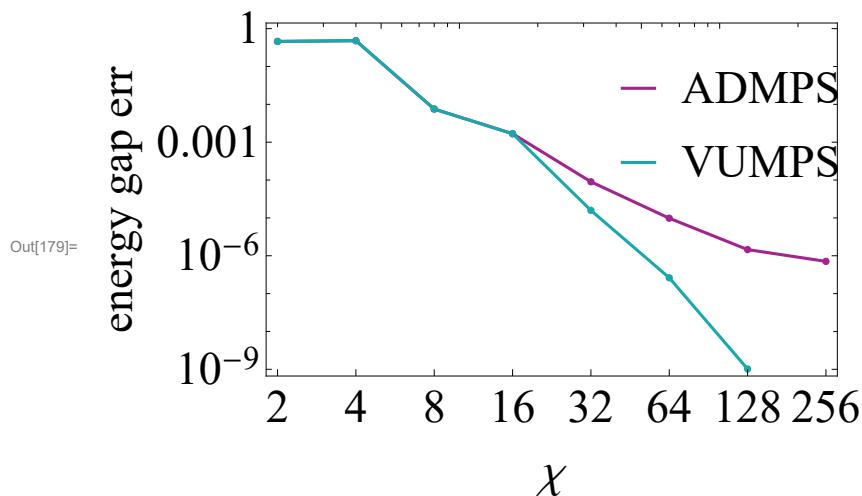


## Heisenberg S=1

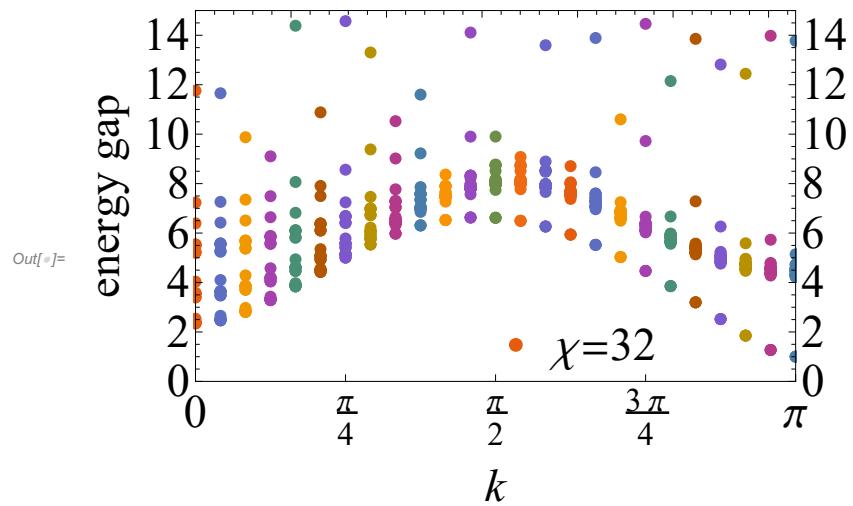
energy gap err



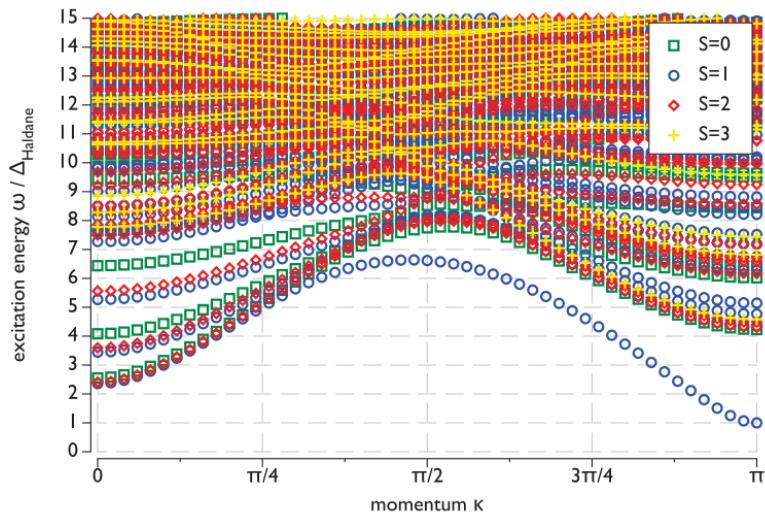
$k = \pi$  energy gap error



## excitation spectrum



PHYSICAL REVIEW B 85, 100408(R) (2012) Fig.3



## TFIsing

