Discovery of a Novel Linear-in-*k* Spin hereas for 3D l inc

avy-hole SS ehiits a cic linear scaling ith *k*, 2D s,

s rr ( ) s .

s s 3D 2D s s . B

s s s s r , s r r r s

sh G,r 's f f r
H . h r s r s f- s s s s
/ h ffr , h h GW r ,
h - H_{GW} H 22 . (h s,
h - rr ff s r h h
GW h r , DA). h s GW r h r s
r r s fr r f r s 23 ,
h D ssh s s G, As 22,24 .
h r h sr s -
s r r h r s -
sr r s . h s , fr , h
s r r r r s .,
( ) / ( ) h $\gg$, h h
s - h r h $= \infty$ ( ) GW s s
f . (1) sr s h
r sh fr r s r
r r s f r r s s s (s r -
sr f. 10):

$$H = - -$$

r s r r s ($n \leq$

h / r s r s s r f

h r h h r s f 0 0 s

r r h h f 0 1 f r s f s r s 15 .

A m . h r f f 2D

h h 0 r r s f s . (3)

f f s s" s

$$(\ ) = - (\ )(\ ) (\ ) + (\ )(\ ) (\ ) + \cdots, \quad (4)$$

h r ( )(( )) s r f s

(r) r f 2D 0 (1 0), h h h

r s h r 17 (

s f r r s ff). h r s f r s

r s (4) s s s r s 3

s r h h ( ) (s r -

s). / s h h f s s (4)

s h r r h f

h h r

(r s 3) s ( ) s -

r r 27 G, f 3D 2D s s -

s ( ) s r r (f T_d D_d), s

s ( ) r s - s ff r

f h h h r s

( ) r r r (-

r s r), ff ( ) s r

s r s r s - h h s

r h s f r r h r

r h s ss h h s ff s,

h ff s s (r r r -

s 0