$S \in$
R^3
$_x, S_y, S_z)$
S_{x_i}
$\hat{x}_i$
R^3
S
S_i
S_i
S
$\hat{i}$
R^3
$_i(S) =$
$i|S$
$\hat{i}$
$\hat{i}$
j
$com-$
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ble
S_i
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$spin-$
up
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$\frac{\hbar}{2}$
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$quan-$
$tized$
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S_i
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ble
S_i
ψ
$\mathcal{H}$
$\frac{1}{2}$
$\mathcal{H} = \{\alpha + + \beta -\}$
(1)
$\alpha, \beta \in$
C
A
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$\mathcal{H}$
A
A
S_z
$_z \doteq$
$\frac{\hbar}{2}10$
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z
$\left(S_z = \frac{\hbar}{2}\right)$
$\psi =$
$+_z \doteq$
1
0
z
$\left(S_z = \frac{-\hbar}{2}\right)$
$\psi =$
$-_z \doteq$
0
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S_y
S_z
$_y \doteq$
$\frac{\hbar}{2}0-$
i
$i0$
y
$\left(S_y = \frac{\hbar}{2}\right)$
$\psi =$
$+_y \doteq$
$\frac{1}{\sqrt{2}}1$
i
y
$\left(S_y = \frac{-\hbar}{2}\right)$
$\psi =$
$-_y \doteq$
$\frac{1}{\sqrt{2}}1$
$-$
i