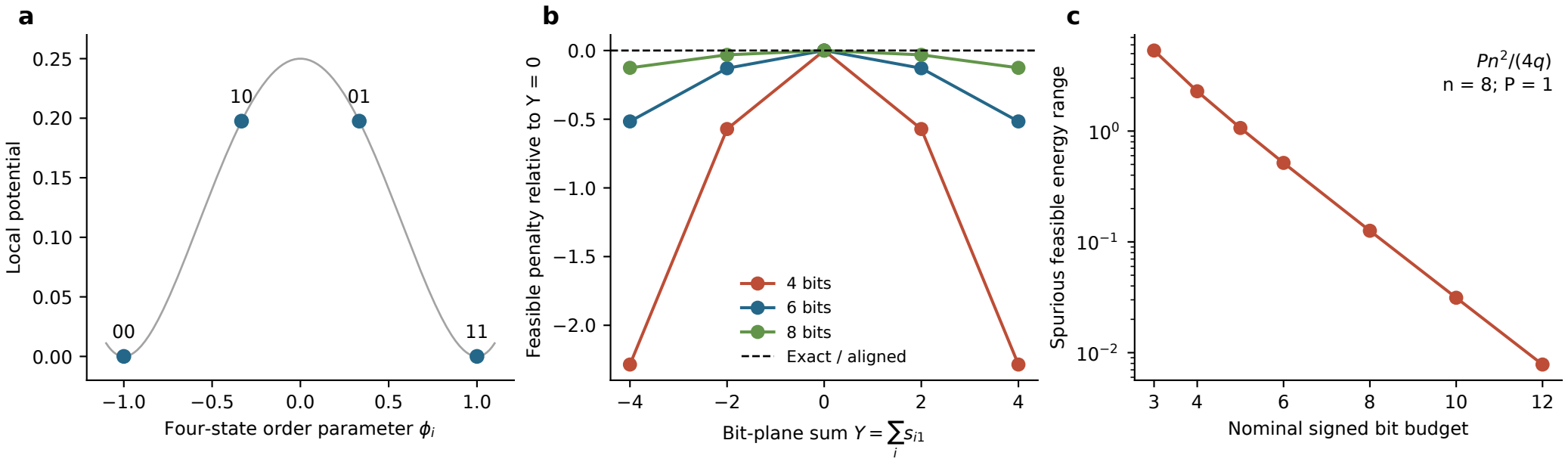

a
Local potential
0.25
0.20
0.15
0.10
0.05
0.00
00
10
01
11
−1.0
−0.5
0.0
0.5
1.0
Four-state order parameter ϕ_i
b
Feasible penalty relative to Y = 0
0.0
−0.5
−1.0
−1.5
−2.0
4 bits
6 bits
8 bits
Exact / aligned
−4
−2
0
2
4
Bit-plane sum $Y = \sum_i s_{i1}$
c
Spurious feasible energy range
10^{0}
10^{-1}
10^{-2}
$Pn^2/(4q)$
n = 8; P = 1
3
4
6
8
10
12
Nominal signed bit budget