

## Baryon Spectrum in Soft-Wall Model

- Upon substitution  $z \rightarrow \zeta$  and

$$\Psi_J(x, z) = e^{-iP \cdot x} z^2 \psi^J(z) u(P),$$

find LFWE for  $d = 4$

$$\begin{aligned} \frac{d}{d\zeta} \psi_+^J + \frac{\nu + \frac{1}{2}}{\zeta} \psi_+^J + U(\zeta) \psi_+^J &= \mathcal{M} \psi_-^J, \\ -\frac{d}{d\zeta} \psi_-^J + \frac{\nu + \frac{1}{2}}{\zeta} \psi_-^J + U(\zeta) \psi_-^J &= \mathcal{M} \psi_+^J, \end{aligned}$$

where  $U(\zeta) = \frac{R}{\zeta} V(\zeta)$

- Choose linear potential  $U = \kappa^2 \zeta$
- Eigenfunctions

$$\psi_+^J(\zeta) \sim \zeta^{\frac{1}{2} + \nu} e^{-\kappa^2 \zeta^2 / 2} L_n^\nu(\kappa^2 \zeta^2), \quad \psi_-^J(\zeta) \sim \zeta^{\frac{3}{2} + \nu} e^{-\kappa^2 \zeta^2 / 2} L_n^{\nu+1}(\kappa^2 \zeta^2)$$

- Eigenvalues

$$\mathcal{M}^2 = 4\kappa^2(n + \nu + 1), \quad \nu = L + 1 \quad (\tau = 3)$$

- Full  $J - L$  degeneracy (different  $J$  for same  $L$ ) for baryons along given trajectory !