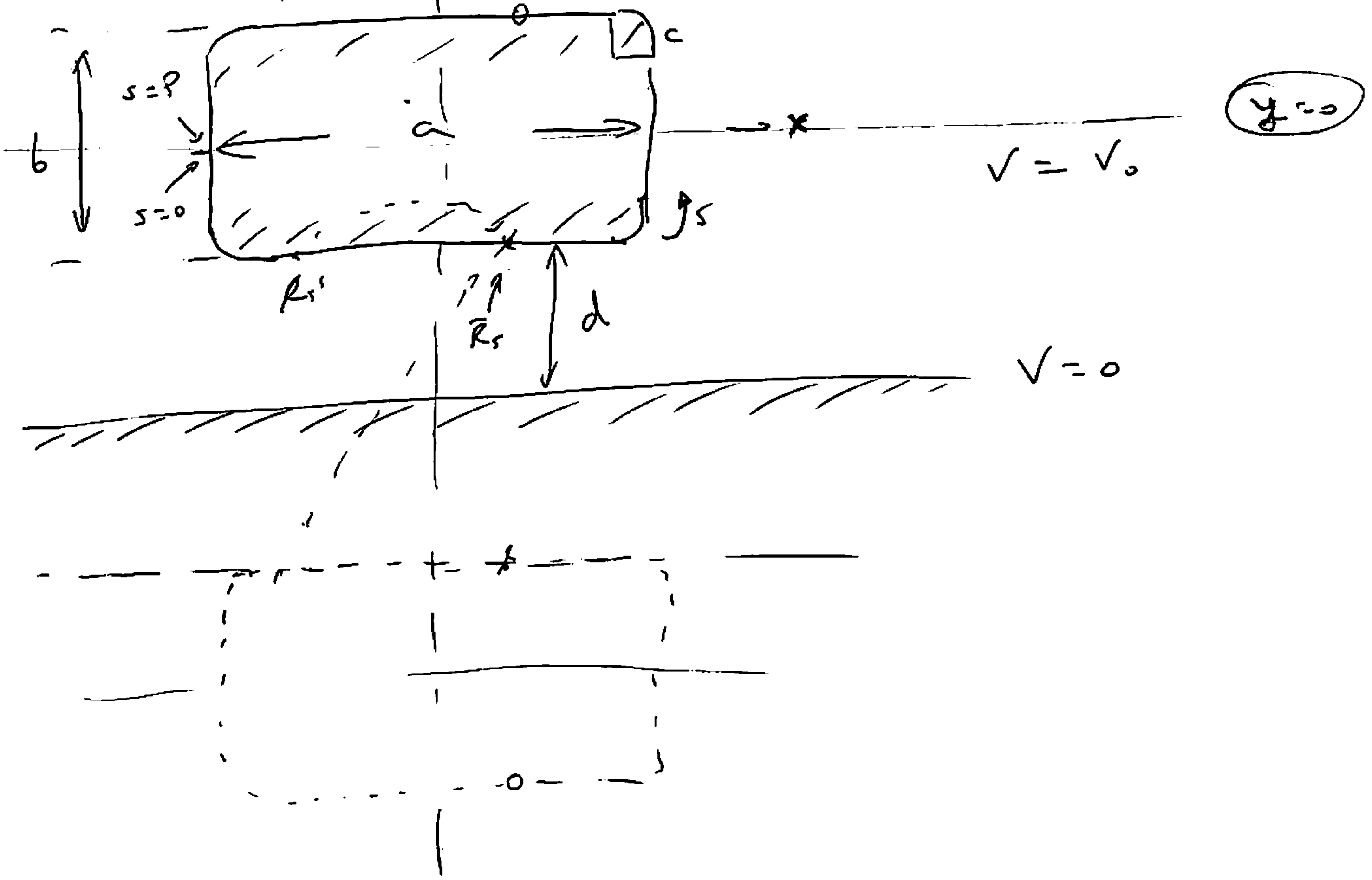
POTENTIAL NEAR BIASED WIRE

27-V-2025
ICFO



P = $2a + 2b - 8c + 2\pi c$

(see 2020-09-19 notes)

$c/a = .55$ in code
$b/a = .66$ " "

$$V_0 = \int dz \oint ds' \, \rho(s') \left[\frac{1}{\sqrt{|\bar{R}_s - \bar{R}_s'|^2 + z^2}} - \frac{1}{\sqrt{|\bar{R}_s - \tilde{R}_s'|^2 + z^2}} \right]$$

at s

$\bar{R} = (x, y)$

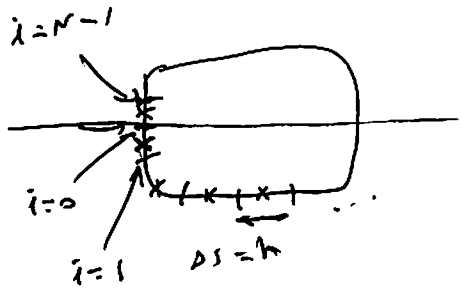
$\tilde{R} = (x, -(2d + b + y))$

$$-\left(y + \frac{b}{2} + d\right) - \frac{b}{2} - d = -(y + b + 2d)$$

$$V_0 = 2 \oint ds' \, \rho(s') \, \ln\left(\frac{z + \sqrt{z^2 + |\bar{R}_s - \bar{R}_{s'}|^2}}{z + \sqrt{z^2 + |\bar{R}_s - \tilde{R}_{s'}|^2}} \right) \Bigg|_0^\infty$$

$$= - \cancel{2} \oint ds' \, \rho(s') \, \ln \cancel{\sqrt{}} \frac{|\bar{R}_s - \bar{R}_{s'}|^2}{|\bar{R}_s - \tilde{R}_{s'}|^2}$$

$$= \oint ds' \, \rho(s') \, \ln\left(\frac{(x_s - x_{s'})^2 + (y_s + y_{s'})^2}{(x_s - x_{s'})^2 + (y_s - y_{s'})^2} \right)$$



$$s_i = \frac{i + 1/2}{N} L \qquad \rho(s_i) = \rho_i$$

$$h = \frac{L}{N}$$

$$\int_{s_j - h/2}^{s_j + h/2} ds' \, \ln \frac{(x_{s_i} - x_{s'})^2 + (y_{s_i} + y_{s'})^2}{(x_{s_i} - x_{s'})^2 + (y_{s_i} - y_{s'})^2} = M_{ij}$$

$$V_0 = M \rho$$

$$V_0 = \sum_j M_{ij} \rho_j \quad \text{indep. of } i$$

$$0 \le i, j < N$$