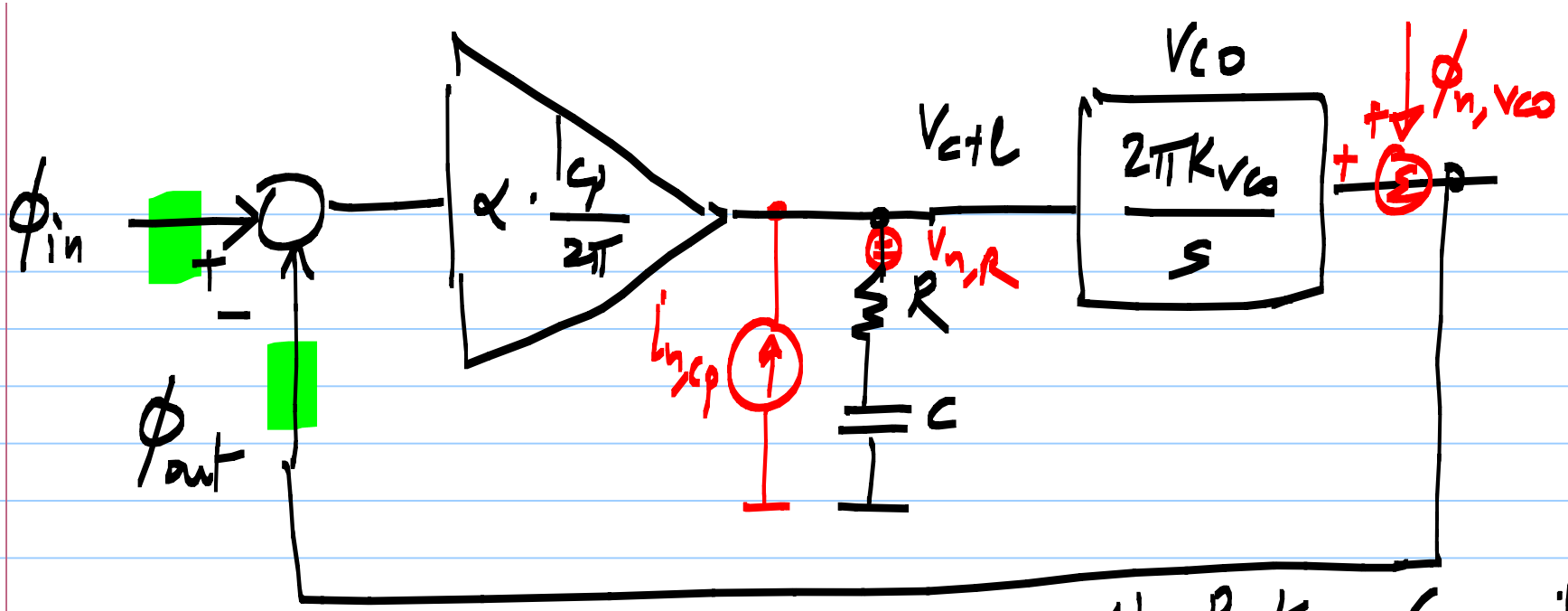
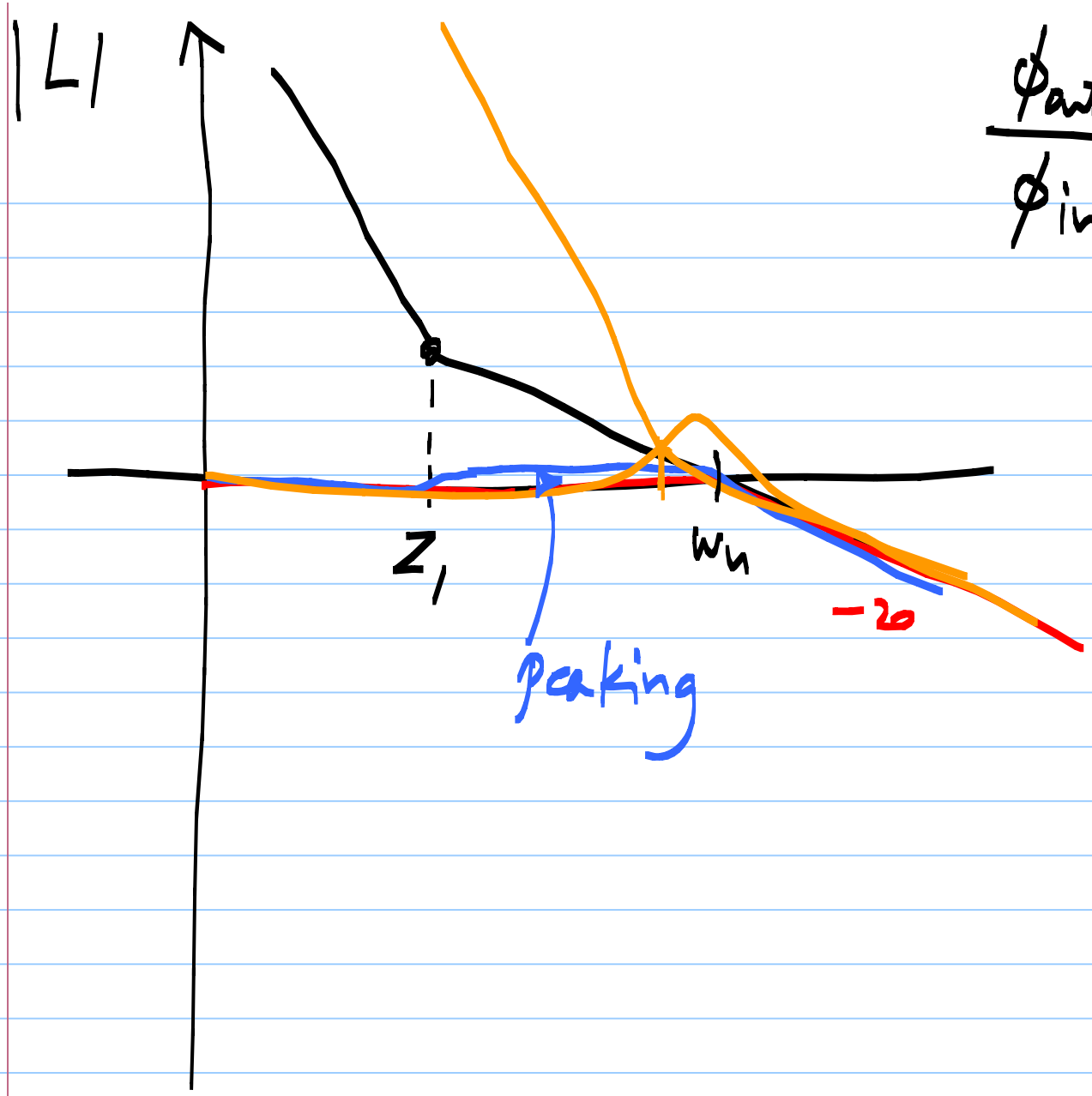


JTOL, JTRAN, JGEN

$$L(s) = \frac{\alpha I_{cp} R \cdot K_{VCO}}{s}\left(1 + \frac{1}{sCR}\right)$$

$$\frac{\phi_{out}}{\phi_{in}} = \frac{\left(1 + s/z_1\right)}{\left(1 + \frac{s}{z_1} + \frac{s^2}{\omega_n z_1}\right)} \qquad \frac{\frac{\omega_n}{s}\left(1 + \frac{z_1}{s}\right)}{}$$

$z_1 \ll \omega_n$



$$\frac{\phi_{out}}{\phi_{in}} = \frac{L}{1+L}$$

$$= \frac{1}{1+1/L}$$

$\simeq L$ if $|L| \gg 1$

$\simeq L$ if $|L| \ll L$

~ first order Lowpass with a bandwidth w_n

$$D(s) = 1 + \frac{s}{z_1} + \frac{s^2}{w_n z_1}$$

$$\left(1 + \frac{s}{z_1}\right)\left(1 + s/w_n\right)$$

$$s^2 + s \cdot w_n + w_n z_1$$

$$\frac{-w_n \pm \sqrt{w_n^2 - 4 w_n z_1}}{2}$$

$$1 + bs + as^2$$

$$p_1 \approx -1/b \quad -(z_1 + \delta)$$

$$p_2 \approx -b/a \quad -w_n$$

JTRAN: $\frac{\phi_{out}}{\phi_{in}}$: ~ 1st order lowpass with a bandwidth ω_n, incl. peaking which depends on how close z_1 is to ω_n

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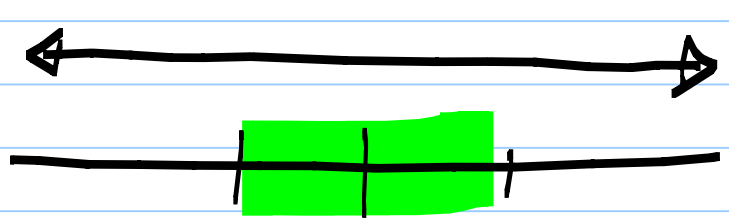


$$|\phi_{out} - \phi_{in}| < \phi_{e,max}$$

ϕ_{in}

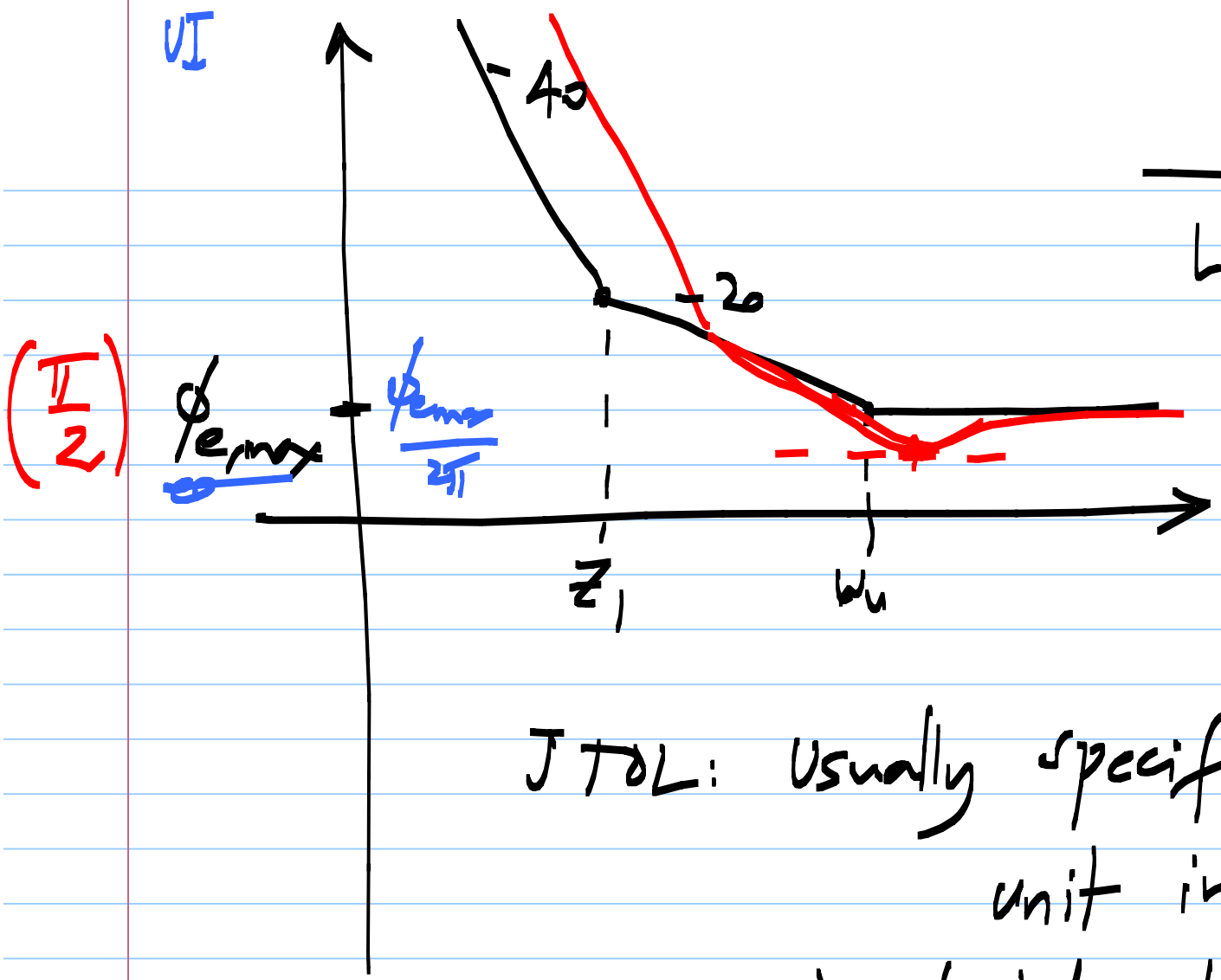
$$\left|\frac{\phi_{out}}{\phi_{in}} - 1\right| < \frac{\phi_{e,max}}{[\phi_{in}]}$$

$$|\phi_{out} - \phi_{in}| < \phi_{e,max}$$

$$\left|\frac{\phi_{out}}{\phi_{in}} - 1\right| < \frac{\phi_{e,max}}{\phi_{in}}$$

JTOL: $$\phi_{in} < \frac{\phi_{e,max}}{\left|\frac{\phi_{out}}{\phi_{in}} - 1\right|}$$

$$\phi_{e,max} \cdot \left|\frac{1 + s/z_1 + s^2/\omega_n z_1}{s^2/\omega_n z_1}\right| \qquad \left|\frac{\omega_n z_1}{s^2} + \frac{\omega_n}{s} + 1\right|$$

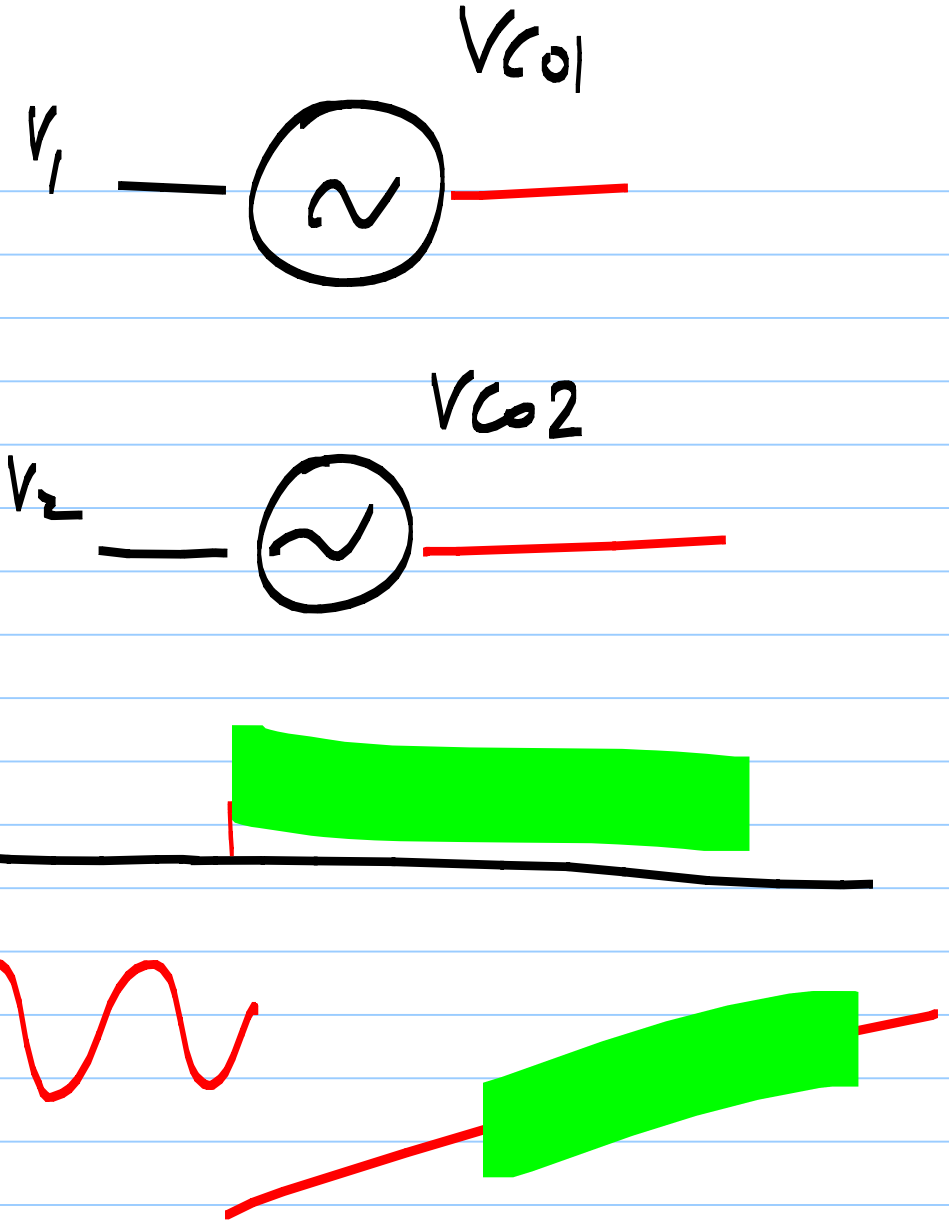


$$\frac{s^2/w_u z_1}{1 + s/z_1 + s^2/w_u z_1}$$

$\left(\frac{UI}{2}\right)$

JTOL: Usually specified in UI unit intervals or in absolute time units.


ideal
data
transition
actual
jitter
$\phi_p \cos(\omega t)$
freq.
of jitter


V_{CO1}
V_1
V_{CO2}
V_2