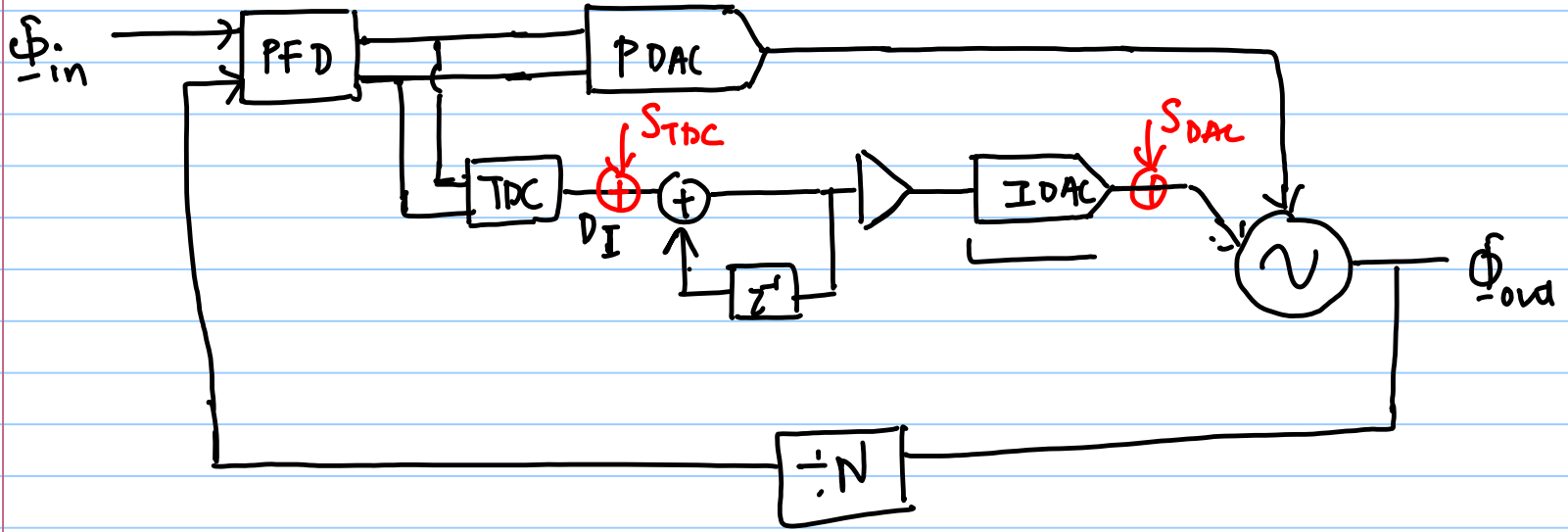
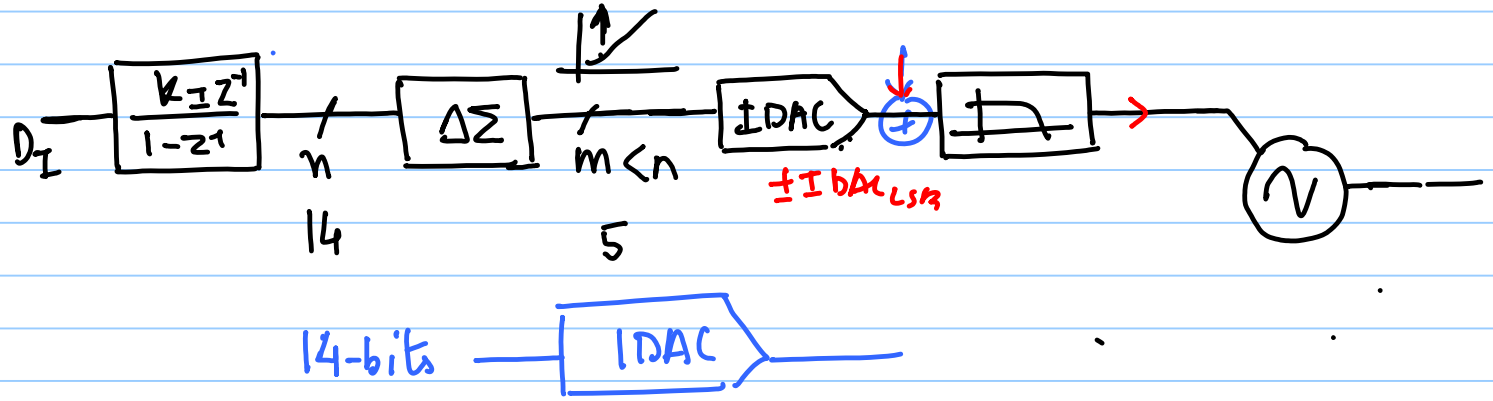
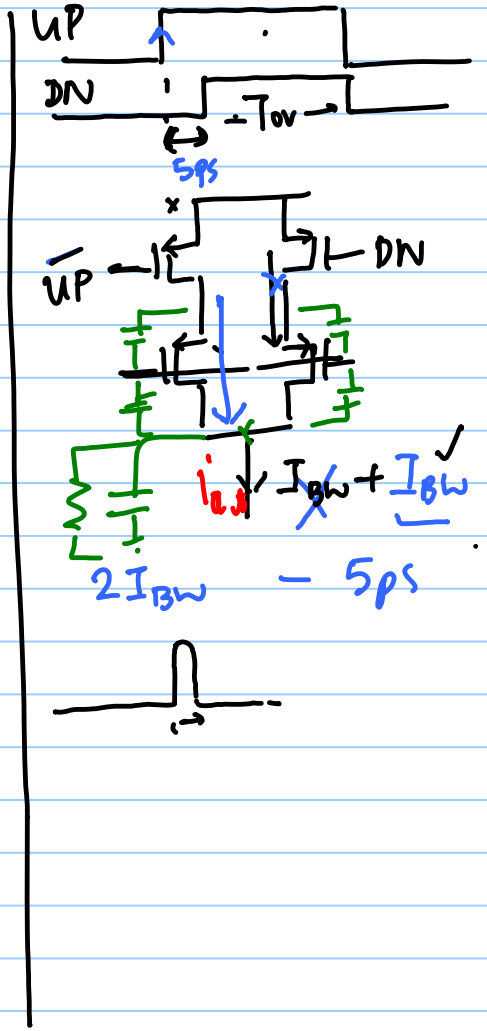
Lecture # 45

Note Title 05-11-2018

Digital PLLs (Hybrid Analog-Digital)





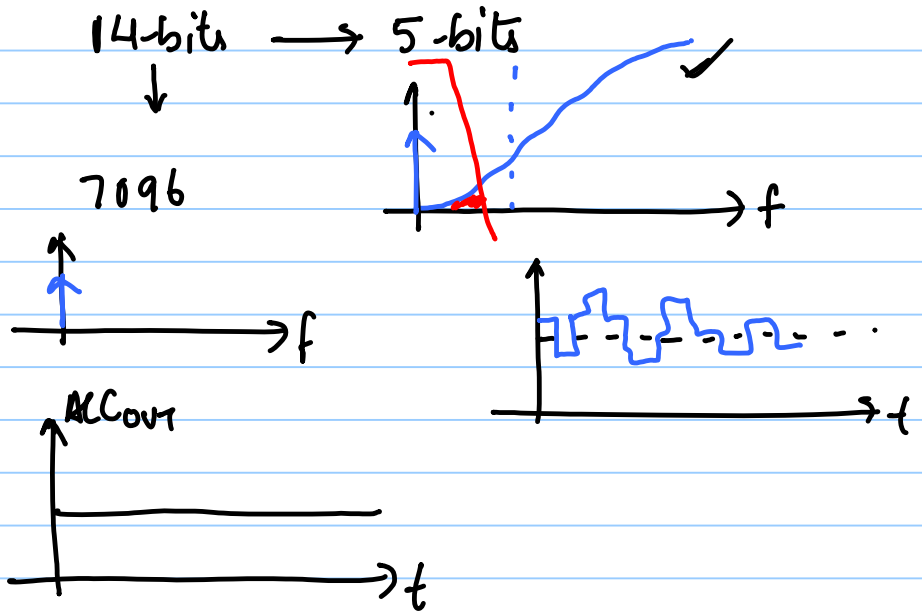


$\pm \Delta F$

$\pm K_{CCO} \times I_{DAC,LSB} = \frac{2\Delta F}{(2^{14}-1)}$

ΔF_{LSB}.

$\Delta F_{LSB} = K_{CCO} \cdot I_{DAC_{LSB}}$

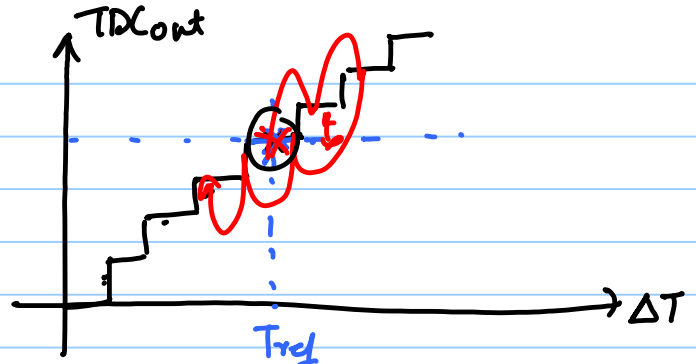


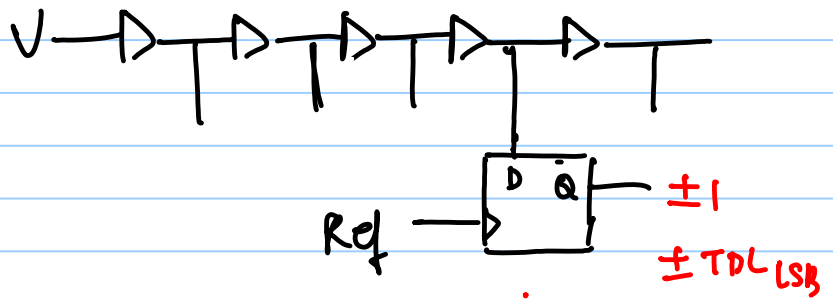
TDC - 3bit →

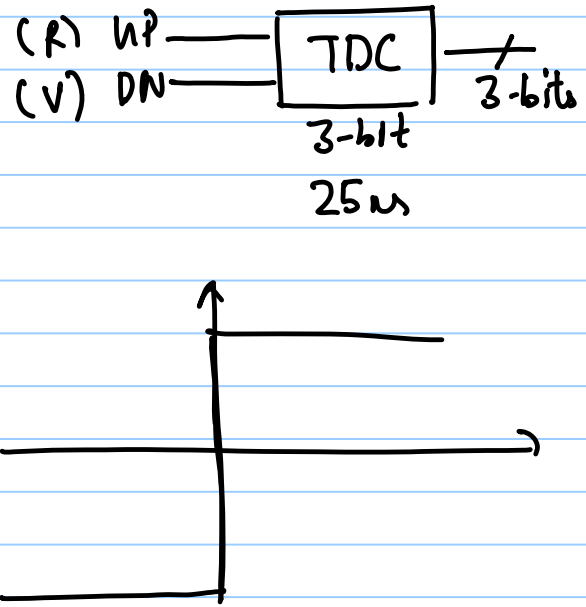
Ref. period (25ns)

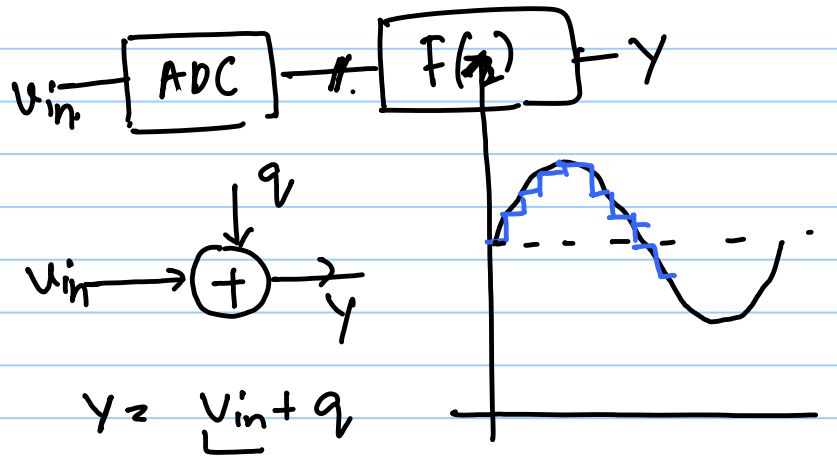
$$TDC_{LSB} = \frac{25\ ns}{2^3} = 3.125\ ns.$$

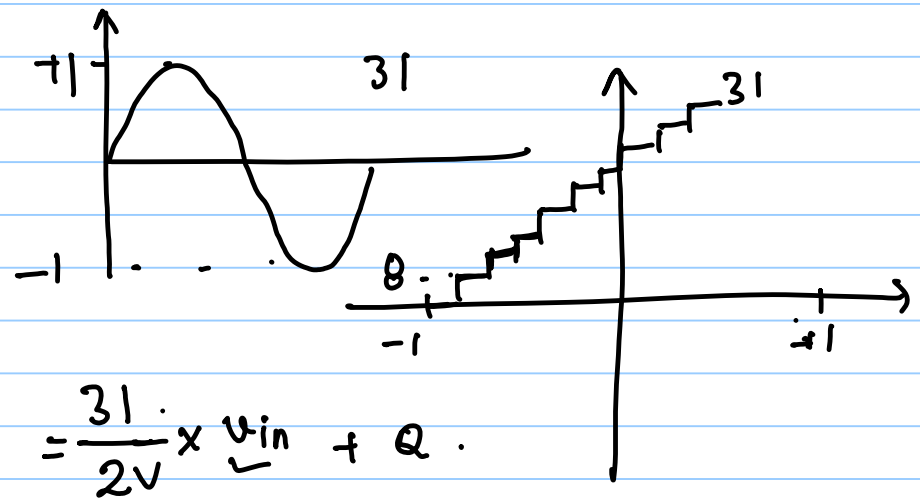
$$\frac{8}{25ns} = TDC\ gain.$$











$$y = \frac{31}{2V} \times V_{in} + Q$$

$$NTF_{DAC} = \frac{2\pi K_{CCO}/s}{1+LG}$$

$$LG = \frac{1}{2\pi}\left[K_P + \frac{K_I \cdot f_{ref}}{s}\right]\frac{2\pi K_{CCO}}{s \cdot N}$$

$$= \frac{K_{CCO}}{s^2 N}\left[sK_P + K_I \cdot f_{ref}\right]$$

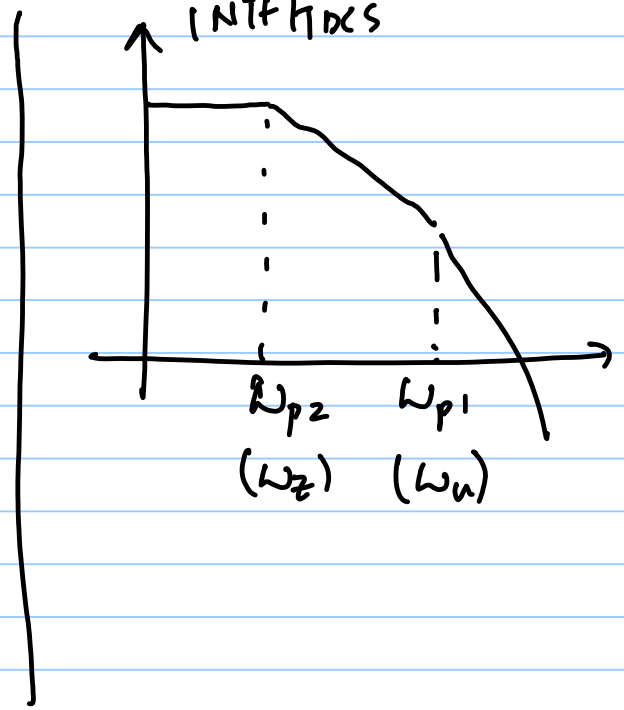
$$NTF_{TDC} = \frac{K_I \cdot z^{-1}}{1-z^{-1}} \frac{2\pi K_{CCO}}{s} \frac{1}{1+LG}$$

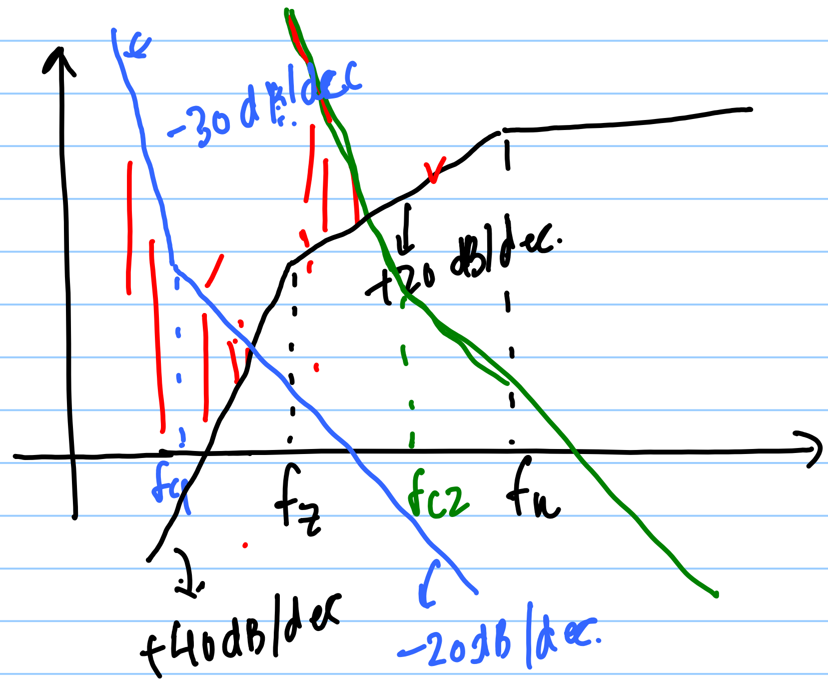
$$= \frac{2\pi K_I K_{CCO} \cdot f_{ref}}{s^2} \frac{1}{1+\frac{K_{CCO}}{s^2 N}\left[sK_P + K_I f_{ref}\right]}$$

$$= \frac{2\pi K_I K_{CCO} \cdot f_{ref}}{s^2 + \frac{K_P K_{CCO}}{N} \cdot s + \frac{K_{CCO} \cdot K_I \cdot f_{ref}}{N}}$$

$$\omega_{p1} = \frac{K_P K_{CCO}}{N}, \quad \omega_{p2} = \frac{K_I \cdot f_{ref}}{K_P}$$

ω_z




-30 dB/dec
+20 dB/dec.
f_{c1}
f_z
fc2
f_n
+40dB/dec
-20dB/dec.