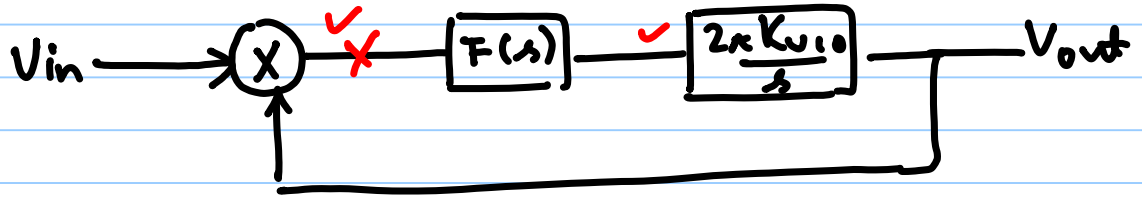
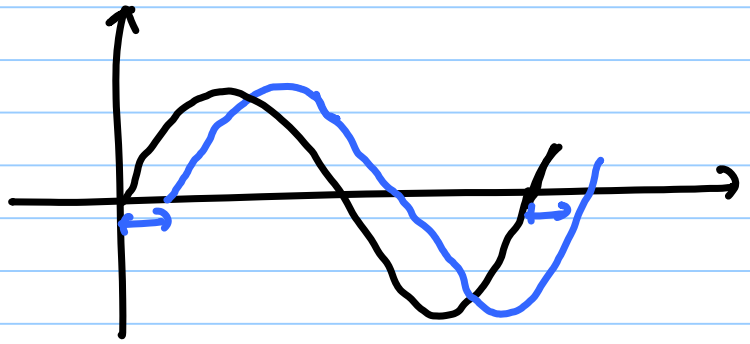
Lecture #9

Note Title 12-08-2017





Ex: $v_{in} = \sin(\omega_{in} t)$; $\omega_{in} = 2\pi \times 1\ GHz$

$0.95 \leq \omega_{out} \leq 1.05\ GHz$.

$K_{VCO} = 100\ MHz/V$

$\Phi(t) = \Delta\omega . t$

$V_e = \sin(\Delta\omega . t)$

$V_{ctrl} = \sin(\Delta\omega . t)$

$f_{VCO} = f_{free} + K_{VCO} . \sin(\Delta\omega . t)$

$\int (\omega_{in} - \omega_{out}) dt$

$= \Delta\omega . t - 2\pi K_{VCO} \int K_{pd} \sin(\Delta\omega . t) dt$

$= \Delta\omega . t - \frac{2\pi K_{pd} K_{VCO}}{\Delta\omega} \left[-\cos(\Delta\omega . t) \right]_{t_1}^{t_2}$

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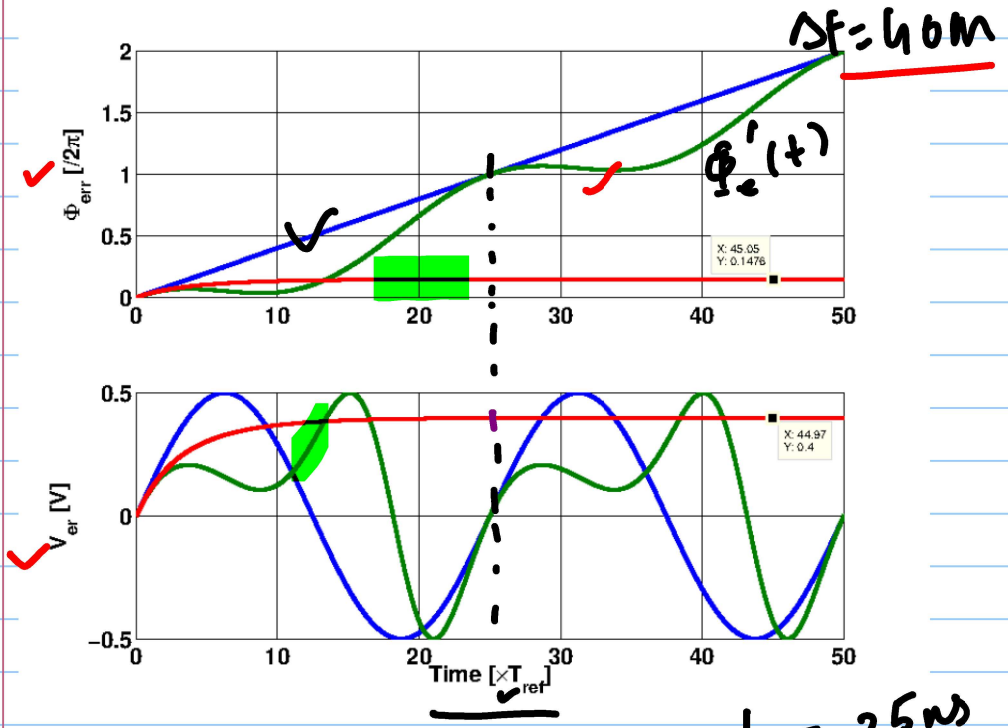
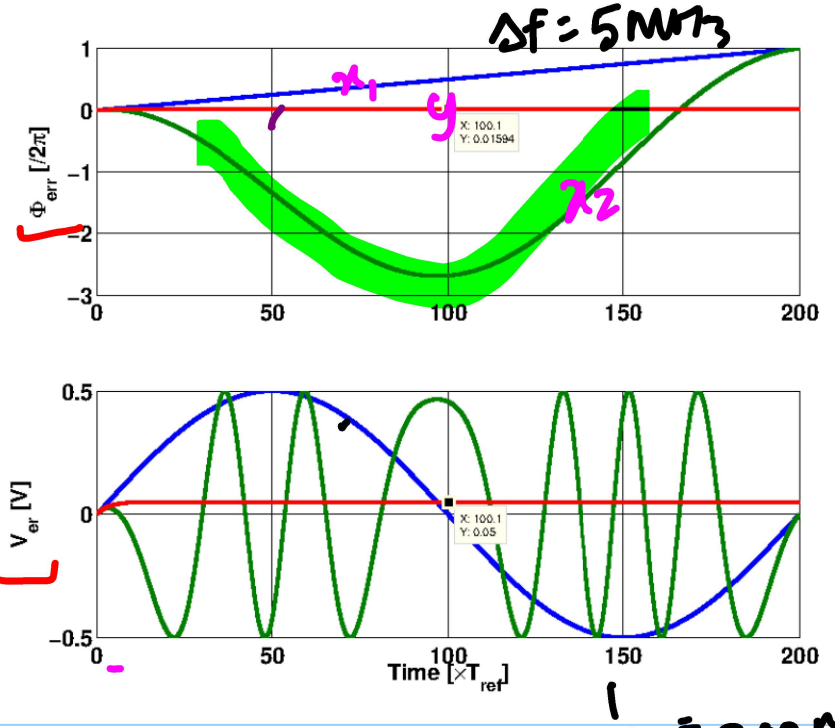




$\frac{1}{\Delta w} = 25ns$

$\frac{1}{\Delta w} = 200ns$

$t=0$; $W_{free} = 960\ MHz$, $W_{in} = 6Hz$, $T_{ref} = 1ns$

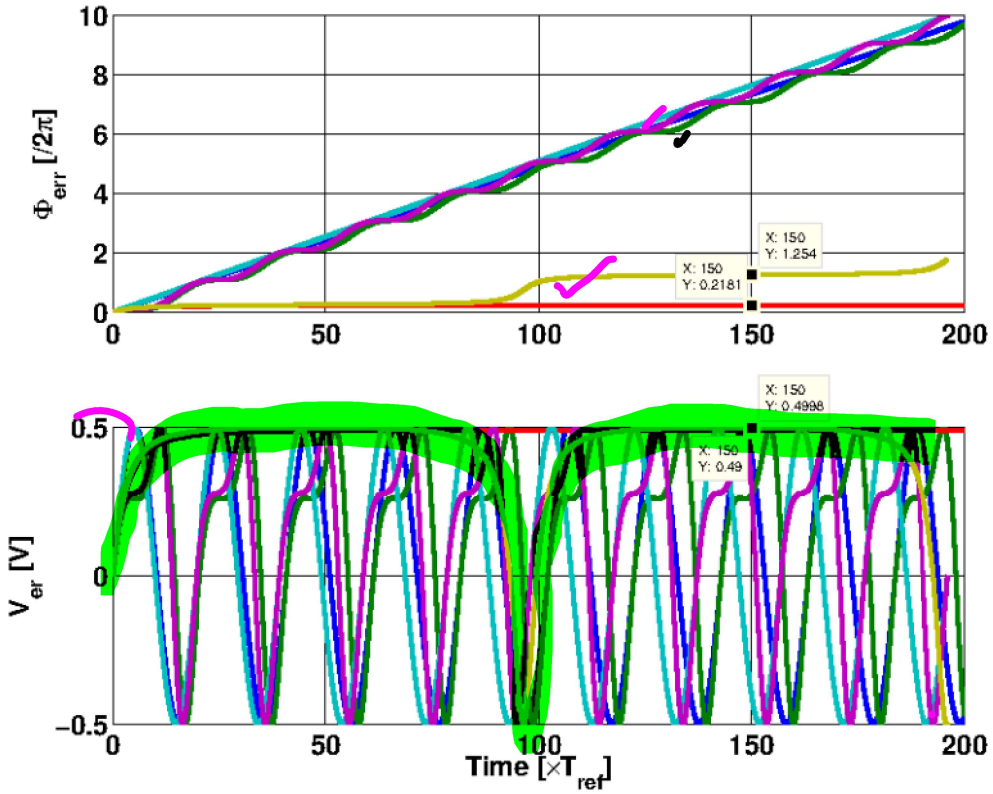
$\Delta W = 40\ MHz = W_{in} - W_{free}$

$\hat{\Phi}_e = \Delta w.t$

$V_e = \sin(\Delta w.t) \times \frac{1}{2}$ — F(s) — V_{ctrl}

$\hat{\Phi}_e'(t) = \Delta w.t - \frac{2\pi K_{vco}.K_{pd}}{\Delta w} - \cos(\Delta w.t) \Big|_0^t$

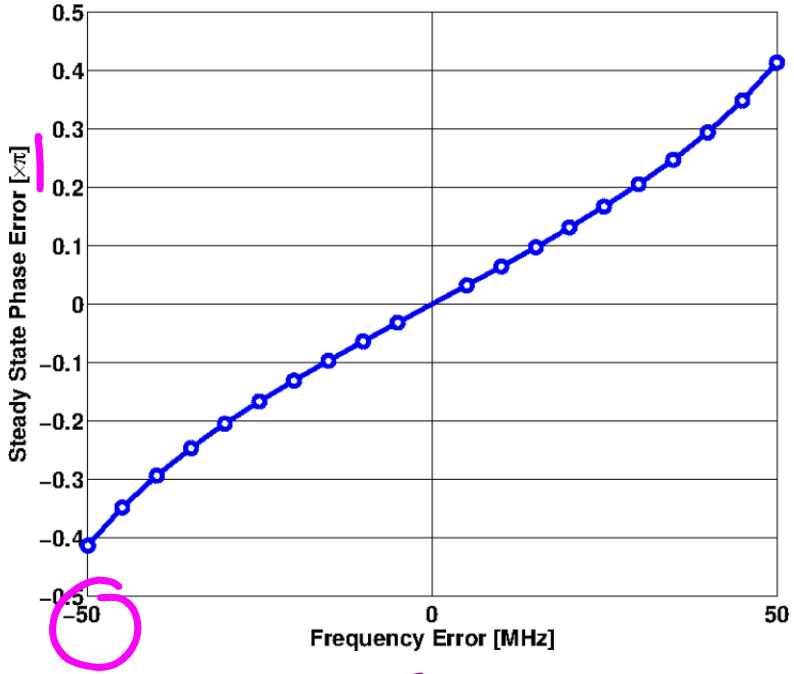
$V_e'(t) = \sin(\hat{\Phi}_e'(t))$

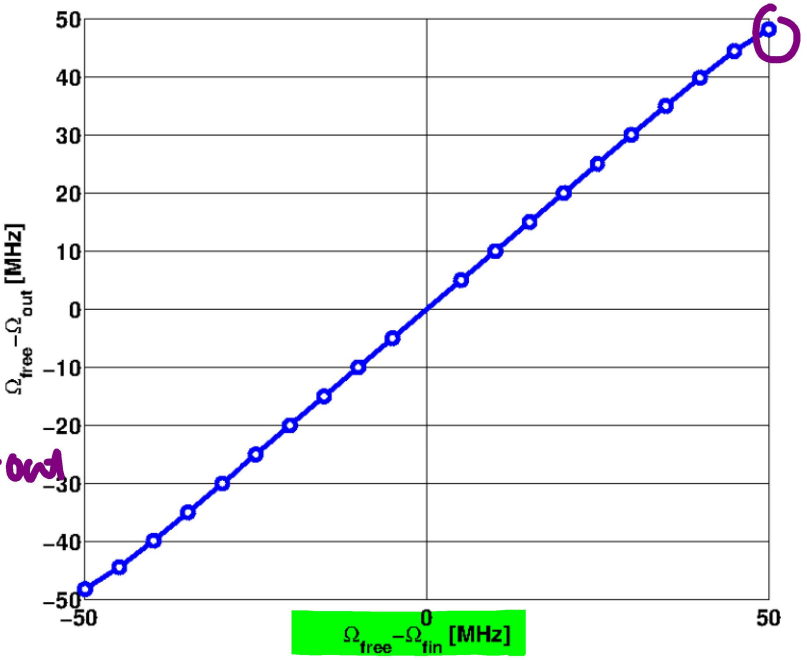


$$\frac{\Delta\omega}{K} = \sin(\phi_c) \leq 1$$

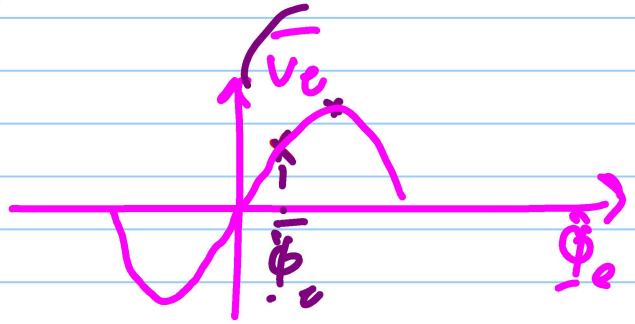
$$\omega_{free} = 940 \text{ MHz}$$

$$T = \frac{2\pi}{\Delta\omega}$$





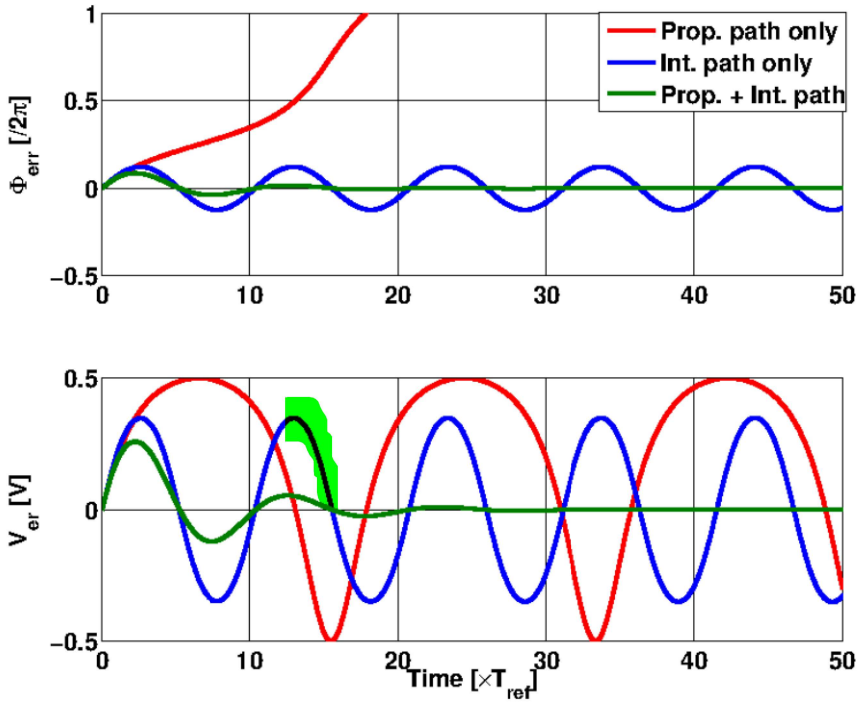
$\Omega_{free} - \Omega_{out}$

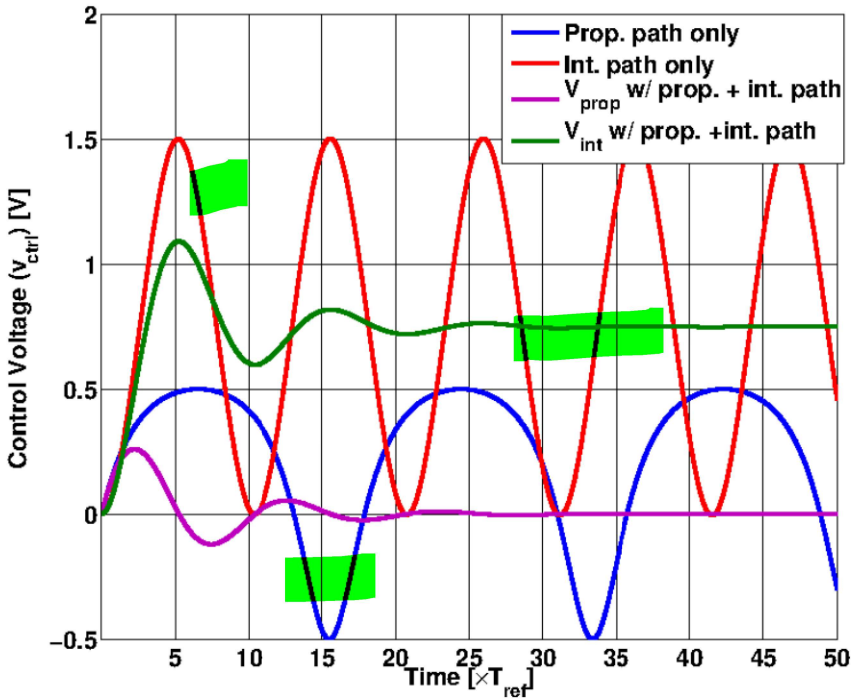


$$\sin(\Phi_e) = \frac{\Delta\omega}{2\pi K_{pd} K_{VCO}}$$

$\Omega_{free} - \Omega_{in}$

$$\Phi_e = \sin^{-1}\left(\quad \right)$$


Prop. path only
Int. path only
Prop. + Int. path
Φ_{err} [/2π]
V_{er} [V]
Time [×T_{ref}]


Prop. path only
Int. path only
V_{prop} w/ prop. + int. path
V_{int} w/ prop. +int. path
Control Voltage (v_{ctrl}) [V]
Time [×T_{ref}]