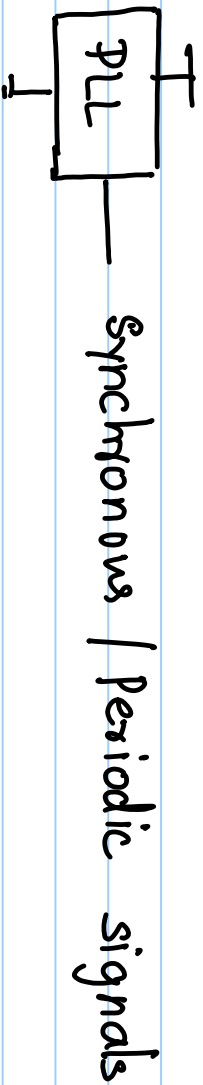


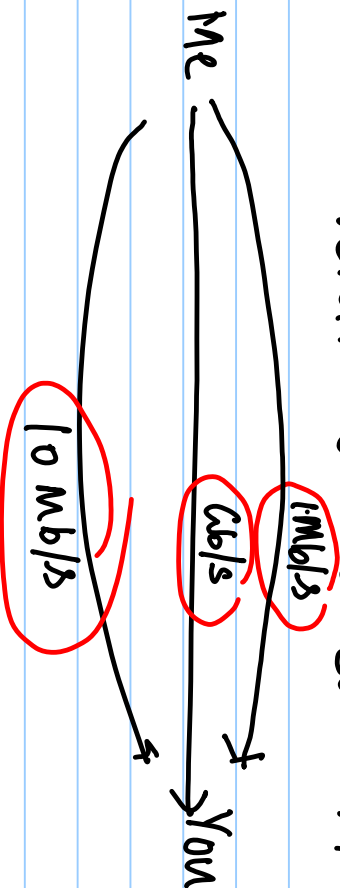
Lecture # 01

EE6324 : Phase-Locked Loops (PLLs)



24 hrs - 1 day  $\xrightarrow{\times 7}$  Week  $\longrightarrow$  Months  $\longrightarrow$

Earth revolves around sun in 365 days 6.25 hrs.



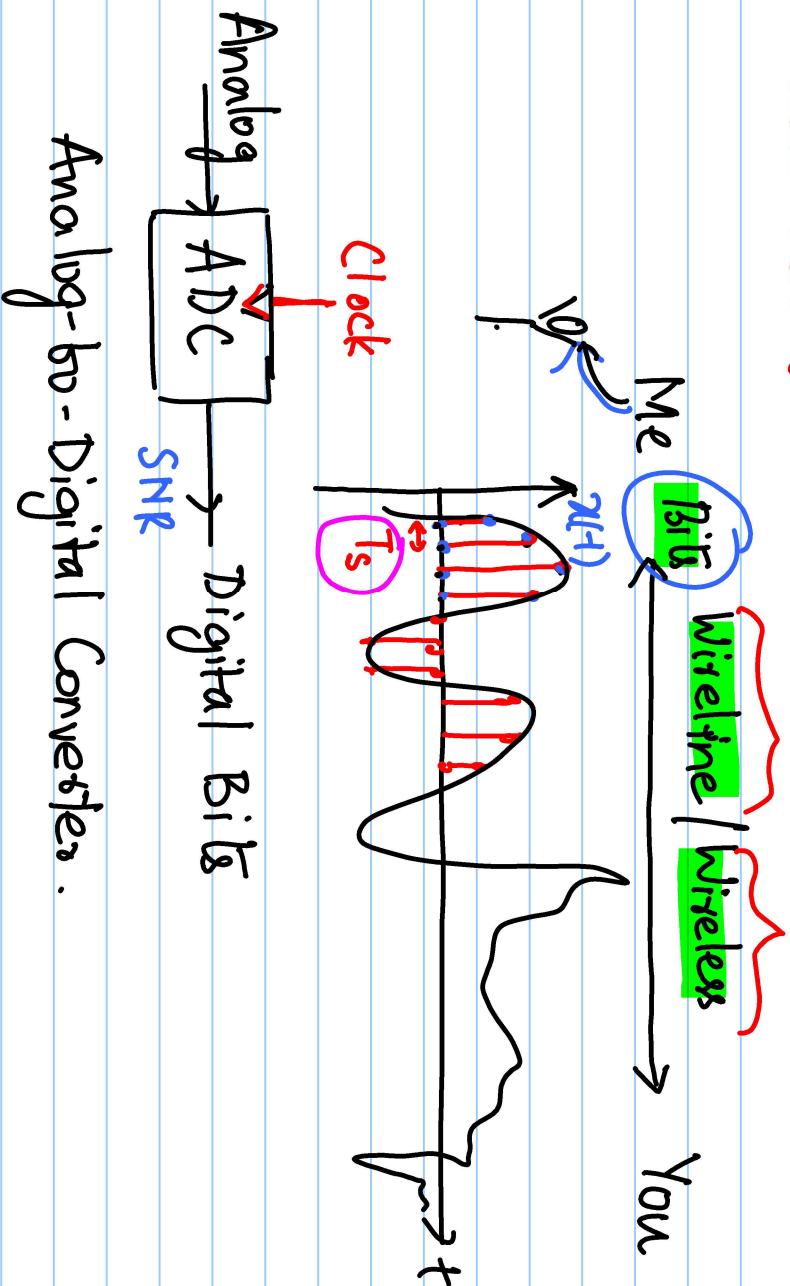
Information is transmitted/received at a fixed rate, Data Rate  $\frac{\# \text{ of bits}}{\text{Time}} = \text{Data Rate}.$

$$1 \text{ hr} : \frac{10^{12} \text{ bits}}{\text{Time}} = \text{Data Rate}$$

Audio/Video  $\Rightarrow$  1 mega-bits in 1 sec.

PLL  $\rightarrow$  Every 1ms I need to send a bit of information.

Clock Generator



$t: 0, T_s, 2T_s, 3T_s, \dots$

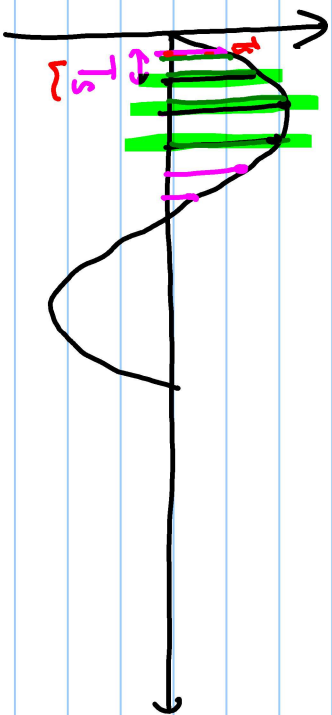
$\Delta t = T_s$  Sampling Time

$$f_s = \frac{1}{T_s}$$

To generate accurate sampling time instants you need a clock.

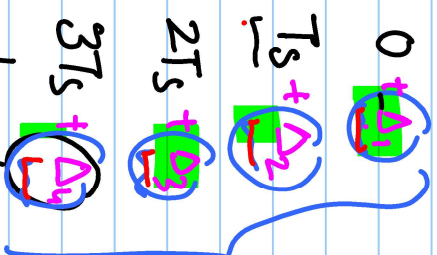
Nyquist Sampling  $\Rightarrow f_s \gg 2 \times$  Bandwidth of signal.

$2 \times 10 \text{ MHz}$



For sampling.

$t = 0$



$\Rightarrow$  Poor Signal to Noise Ratio at ADC's output

$$\text{SNR} = \frac{\text{Signal Power}}{\text{Noise Power}}$$

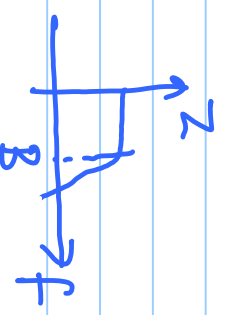
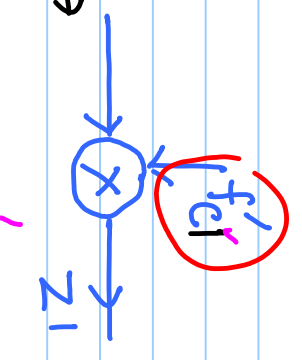
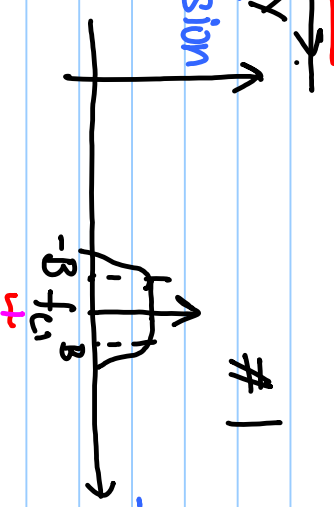
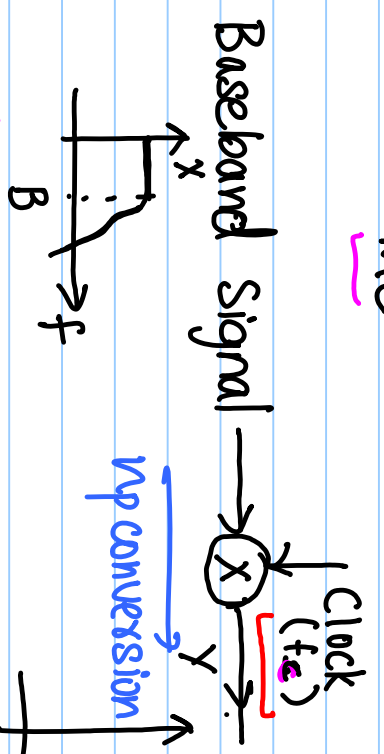
Noise Power

Bits

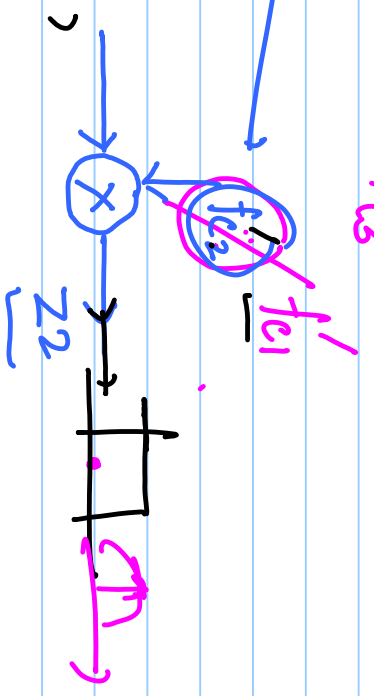
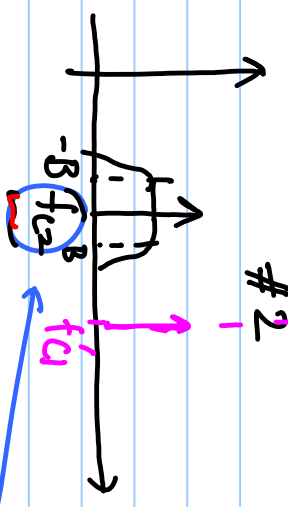
Me

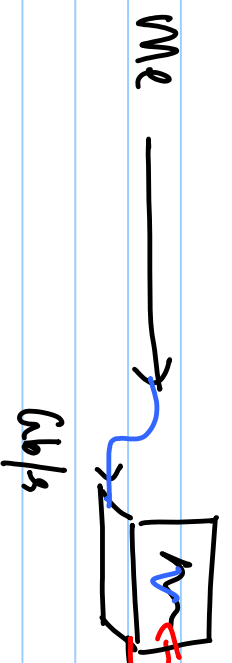
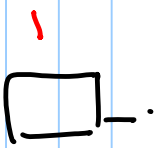
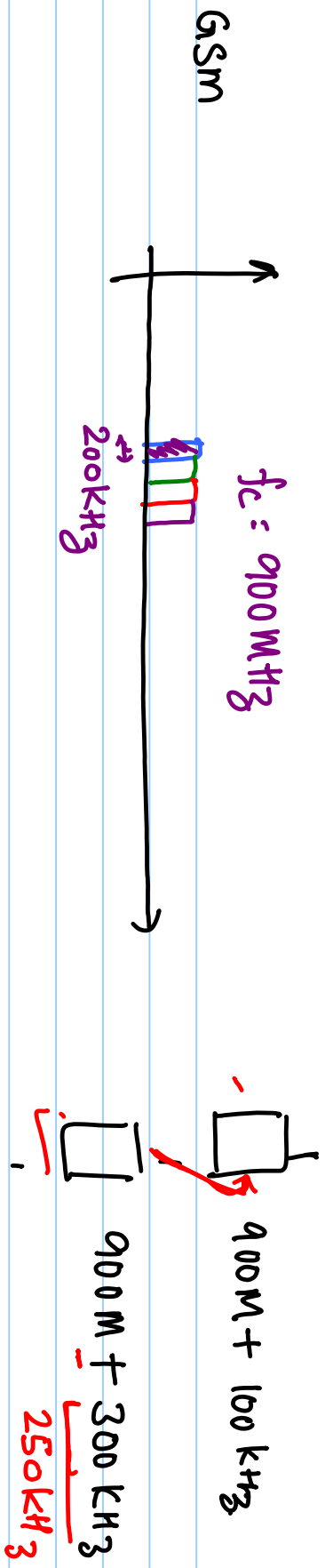
You

"Homodyne Receivers"

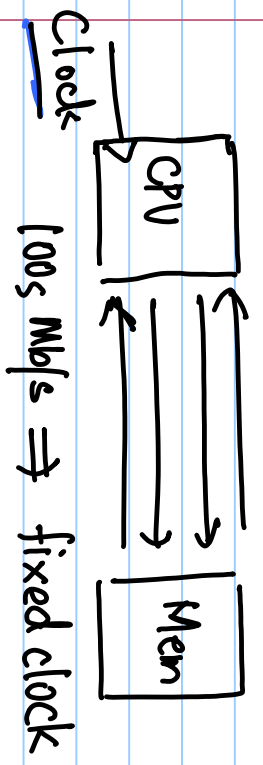


strict requirements on clock signals which are used in wireless domain.





After processing  
 CPU ← Bits → Memory  
 stored in



You need clock.

— Communication Systems Wired  
Wireless

— Analog-to-digital converter

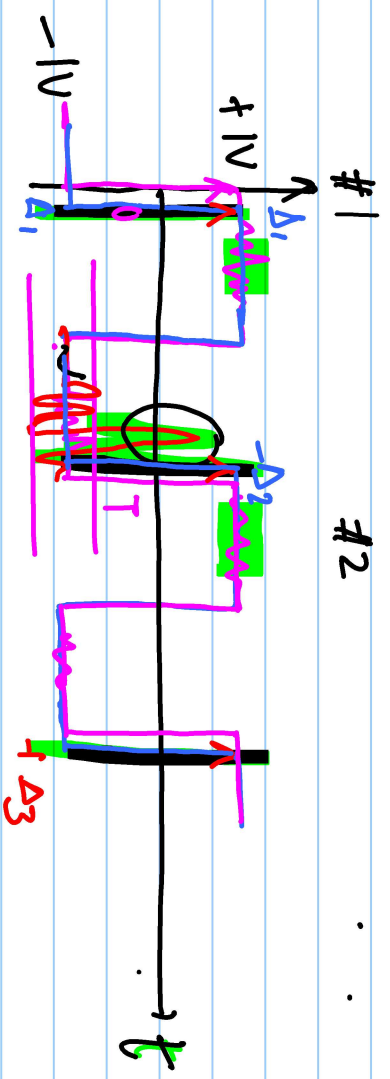
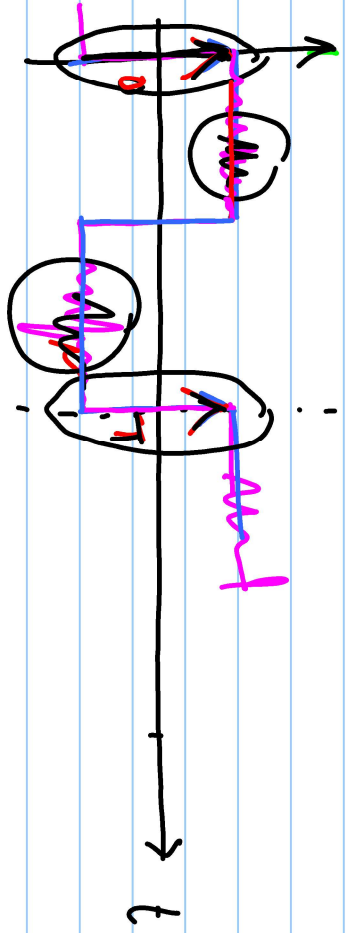
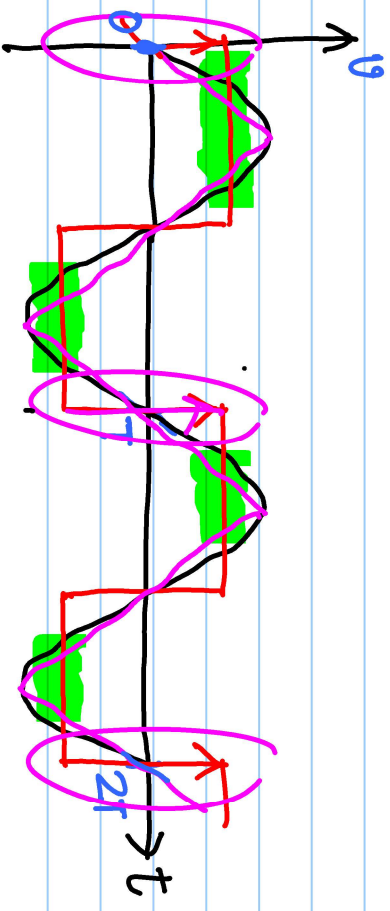
Digital-to-analog converter

— Any synchronous system

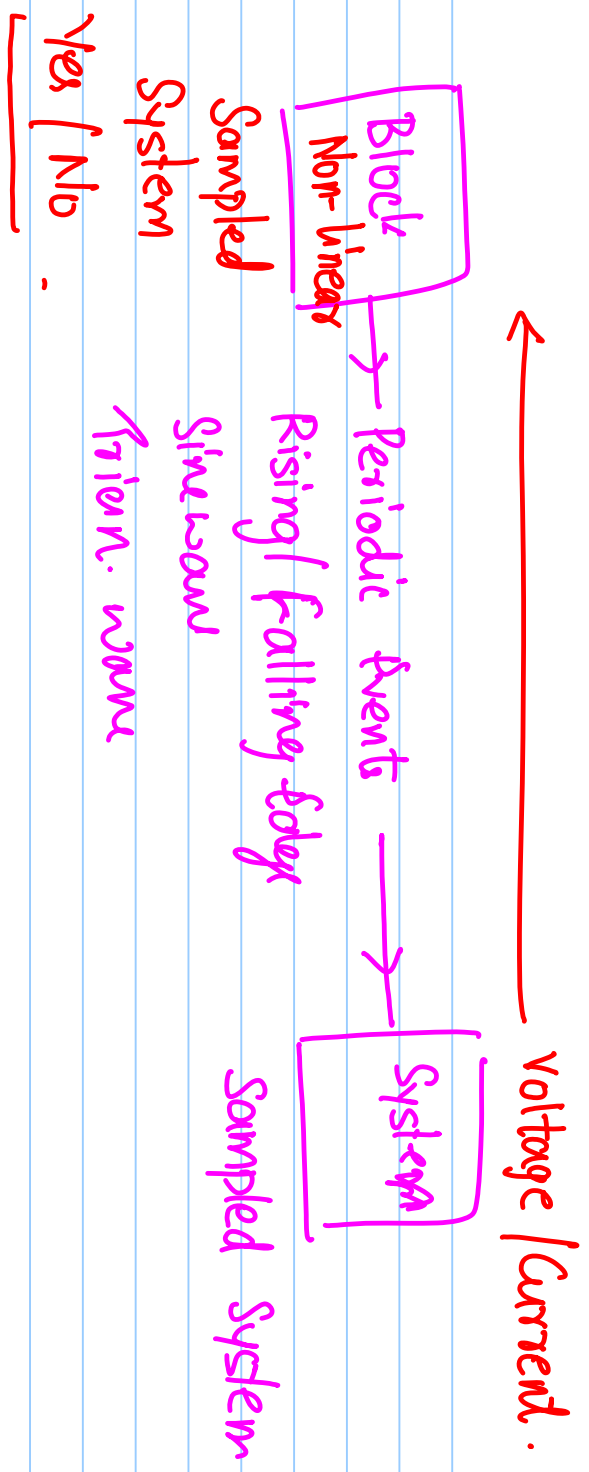
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I am here.

Appl. ✓



⇒ Periodic event is more important than the actual waveforms.



Yes / No .