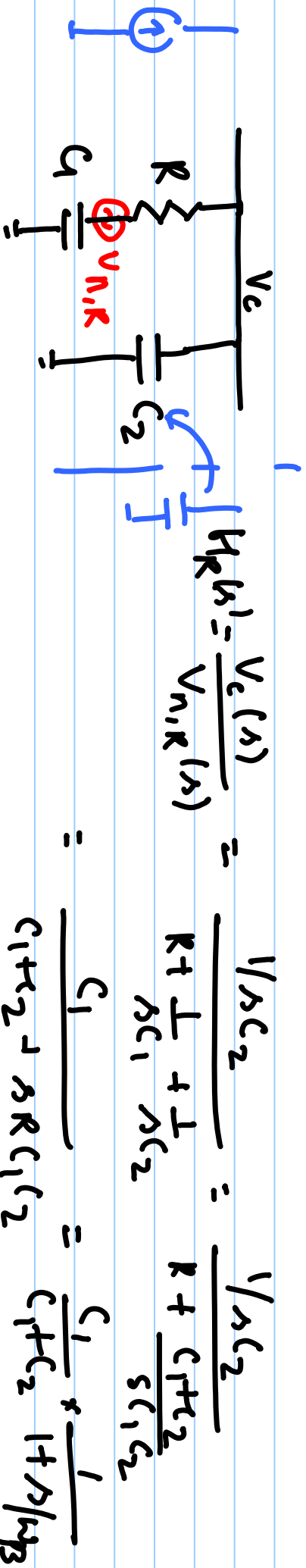


Lecture # 22

Noise contribution of PLL blocks.

4. Resistor (R)



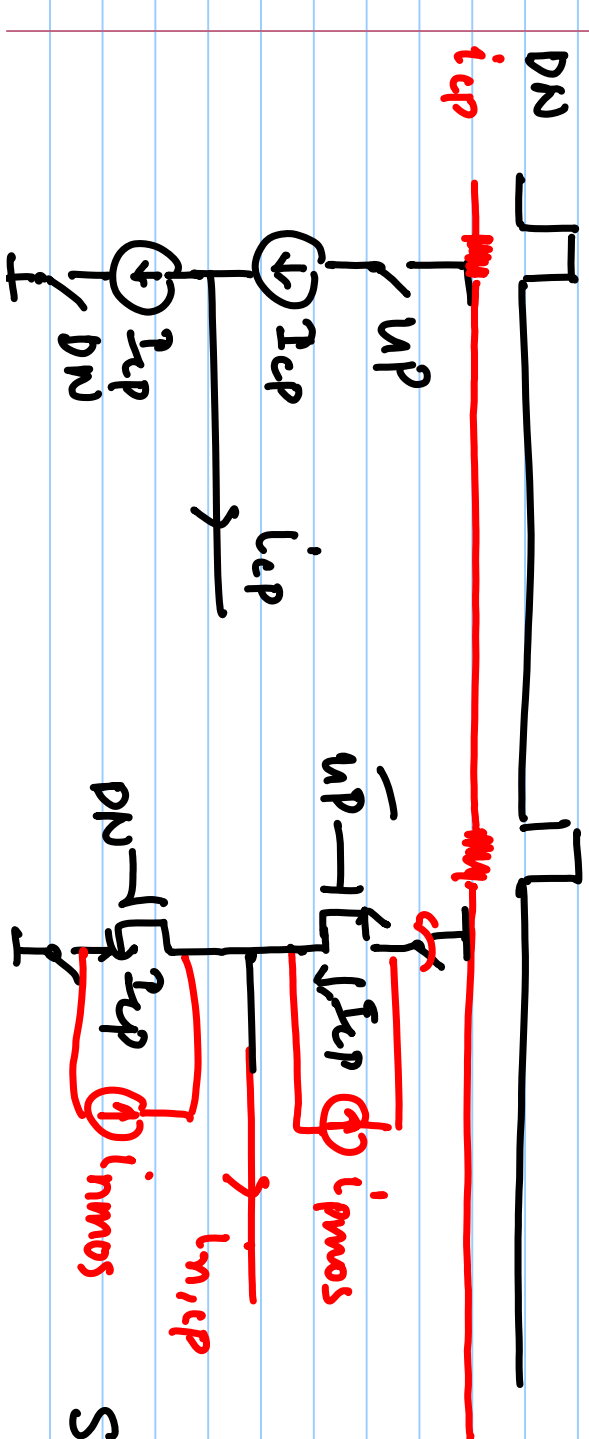
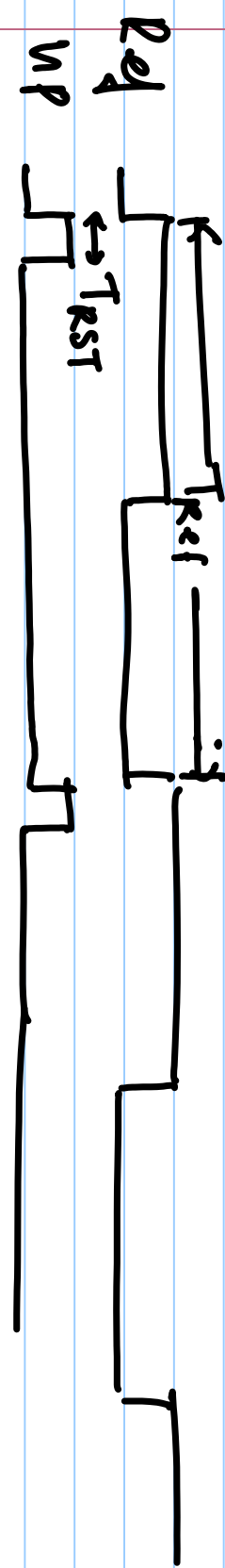
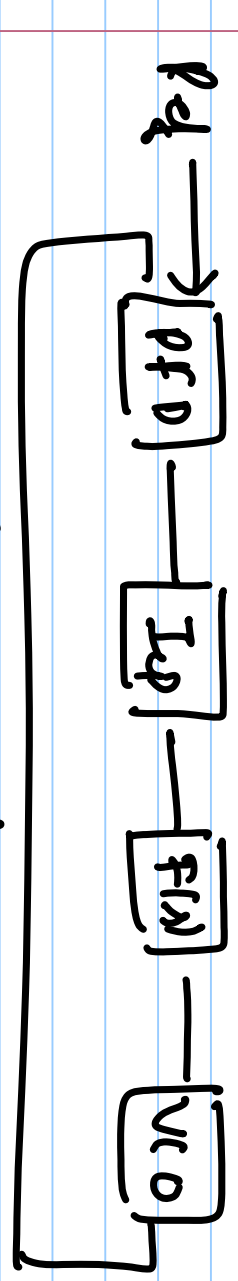
$$H_R(s) = \frac{V_c(s)}{V_{n,R}(s)} = \frac{1/sC_2}{R + \frac{1}{sC_1} + \frac{1}{sC_2}} = \frac{1/sC_2}{R + \frac{C_1 + C_2}{sC_1C_2}} = \frac{C_1}{C_1 + C_2} \times \frac{1}{1 + sR/C_1}$$

$$\omega_{ps} = \frac{1}{R \frac{C_1 C_2}{C_1 + C_2}}$$

$$V_{n,R} \times H_R(s) = V_{n,R}'$$



$$S'_r = |H_{r1}|^2 S_r = 4kTR |H_{r1}|^2$$



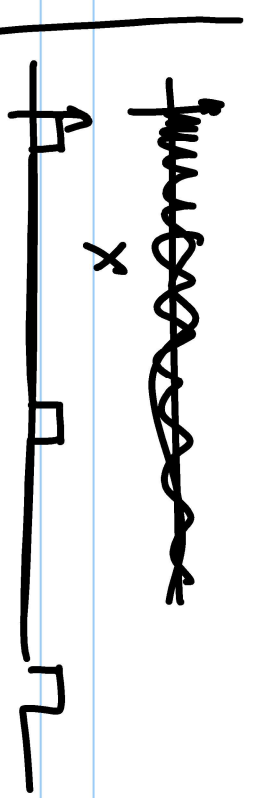
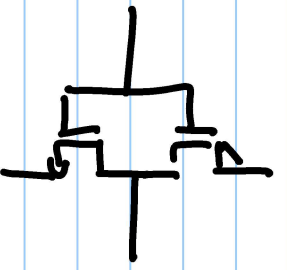
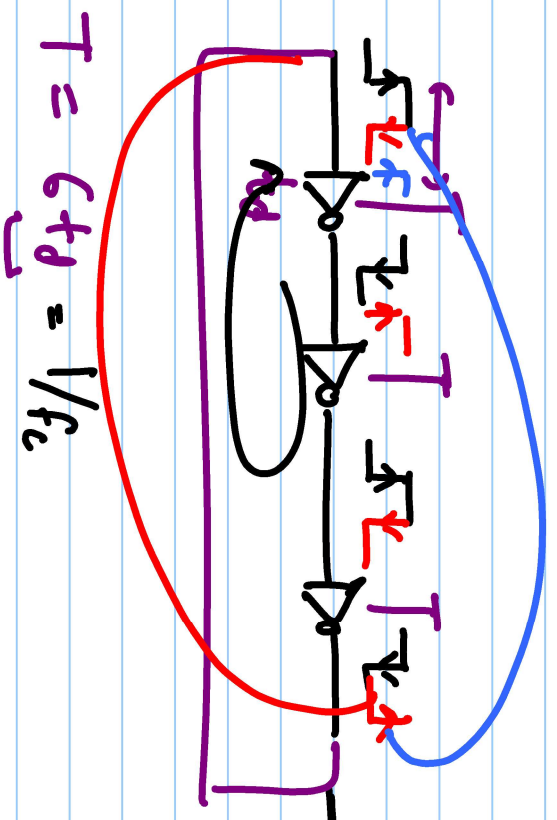
$$i_{n,cp} = i_{n,pmos} + i_{n,npmos}$$

$$T_{n,cp} = \frac{T_{n,pmos}}{2} = \frac{i_{n,pmos}}{i_{n,cp}} + \frac{T_{n,npmos}}{2}$$

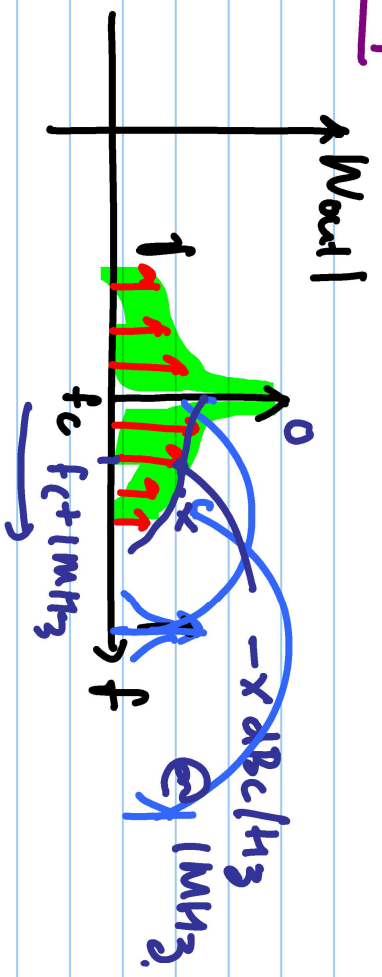
$$S_{icp} = 4kT \gamma (g_{mp} + g_{mn})$$

$$S_{icp} = \frac{I_{RST}}{I_{ref}} \times 4kT \gamma (g_{m1} + g_{m2})$$

3) VCO



- LC oscillator
- Ring oscillator



PSS (Periodic Steady State) Analysis.

Do-Do-Do-1

ADE L (1) - ssaxenalib_2016 SS_TEST_RINGOSC config

Launch Session Setup Analyses Variables Outputs Simulation Results Tools Callout Help **cadence**

Design Variables

Name	Value
1 vsup	1.2
2 cup	2.5f
3 vbp	546.3m
4 vosc	900m
5 cdn	cup

Analyses

Type	Enable	Arguments
1 dc	<input type="checkbox"/>	1
2 tran	<input type="checkbox"/>	0 200n conservative
3 pss	<input checked="" type="checkbox"/>	5G 5 A /IB
4 pnoise	<input checked="" type="checkbox"/>	5 10K 1G 10 A /IB

Outputs

Name/Signal/Expr	Value	Plot	Save	Save Optio
1 CLK_0		<input type="checkbox"/>	<input type="checkbox"/>	no
2 CLK_180		<input type="checkbox"/>	<input type="checkbox"/>	no
3 VOSC		<input type="checkbox"/>	<input checked="" type="checkbox"/>	yes
4 V16/PLUS		<input type="checkbox"/>	<input checked="" type="checkbox"/>	yes
5 avg_freq		<input type="checkbox"/>	<input type="checkbox"/>	yes
6 lavn_osc		<input type="checkbox"/>	<input type="checkbox"/>	

Plot after simulation: **Auto** Plotting mode: **Replace**

Status: Ready | T=27 C | Simulator: spectre | State: spectre_stater1

Choosing Analyses -- ADE L (1)

Analysis

tran dc ac noise
 xt sens dcmatch stb
 pz sp envlp pss
 pac pstb pnoise pxf
 psp qpss qpac qpnoise
 qpxf qpasp hb hbac
 hnoise hbsp

Periodic Steady State Analysis

Engine

Shooting Harmonic Balance

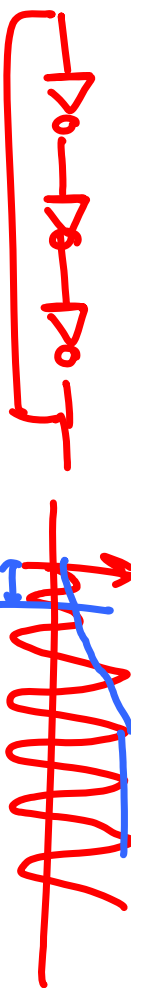
Fundamental Tones

#	Name	Expr	Value	Signal	SrcId

Beat Frequency Beat Period 5G Auto Calculate

Output harmonics

Number of harmonics **5**



10mV

Accuracy Defaults (errpreset)

- conservative moderate liberal

Additional Time for Stabilization (tstab) **10m**

Save Initial Transient Results (saveinit) no yes ✓

Oscillator Oscillator node+ /I **0V1** Select

Oscillator node- /IB **GND** Select

Calculate initial conditions (ic) automatically ✓

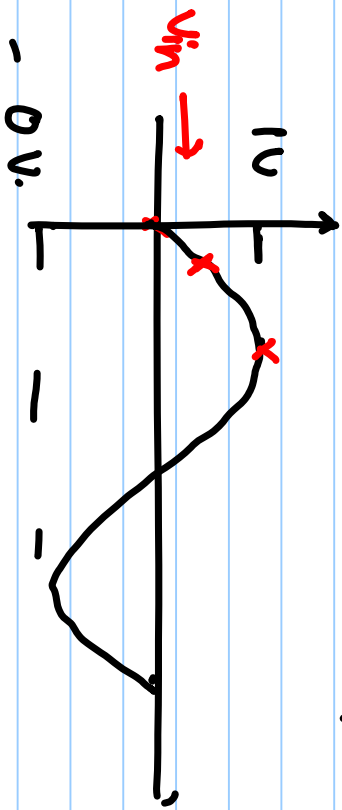
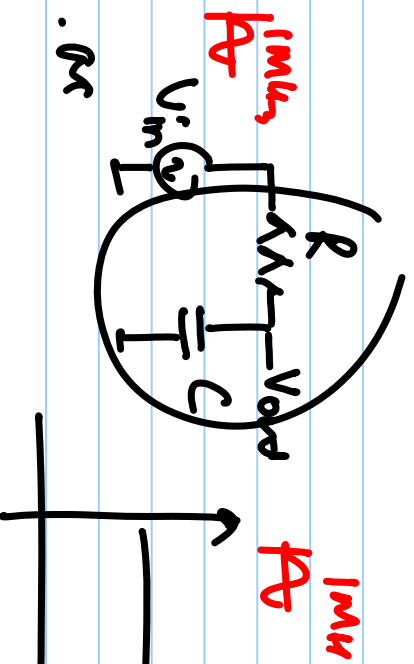
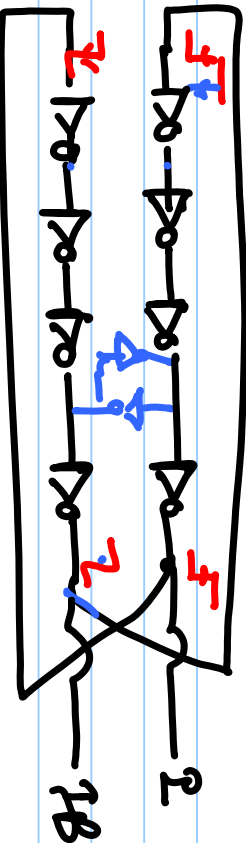
Sweep

New Initial Value For Each Point (restart) no yes

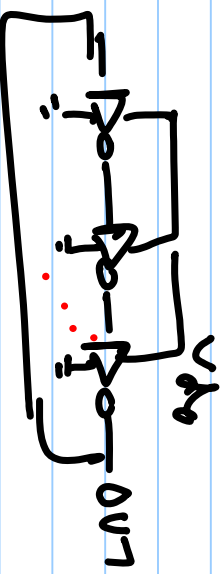
Loadpull

Enabled

Options...



PAC



Periodic Noise Analysis (PNOISE)

Choosing Analyses -- ADE L (1)

Analysis

tran dc ac noise
 xf sens dcmatch stb
 pz sp envlp pss
 pac pstb pnoise pxf
 psp qpss qpac qpnoise
 qpstf qpssp hsp hbac
 hnoise hbosp

Periodic Noise Analysis

PSS Beat Frequency (Hz)

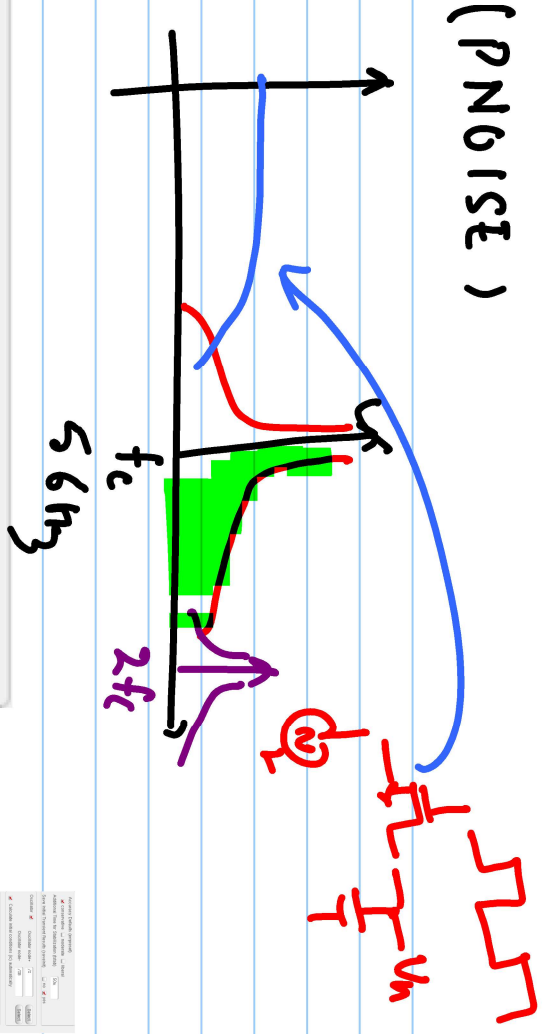
Multiple pnoise

Sweep Type

Sweep Type: Logarithmic Points Per Decade Number of Steps
 Output Frequency Sweep Range (Hz): Start 10k Stop 10
 Relative Harmonic: 1

Sidebands

Method: default fullspectrum
 Maximum sideband: 5
 When using shooting engine, default value is 7.



Output

Voltage: Positive Output Node Negative Output Node
 /I: /IB:

Input Source: none

Noise Type: sources

sources: single sideband (SSB) noise analysis

Noise Separation: yes no

separate noise into source and gain

Enabled:

Options...



Direct Plot Form

Plotting Mode Append

Analysis

pss pnoise tstab

Function

Output Noise Input Noise
 Noise Figure Noise Factor
 NFdsb Fdsb
 NFieee Fieee
 Phase Noise Transfer Function

Loadpull Contour

Add To Outputs Plot

> Press plot button on this form... OK Cancel Help

