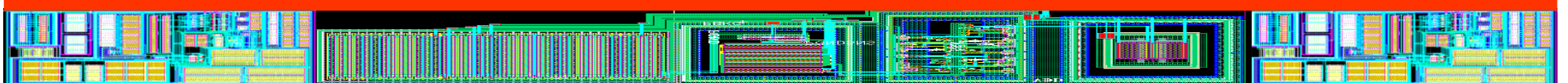
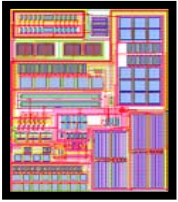


# EE6326 Analog IC Design - Fall 2008

Topic 6. Operational Amplifier (OPAMP) - 3

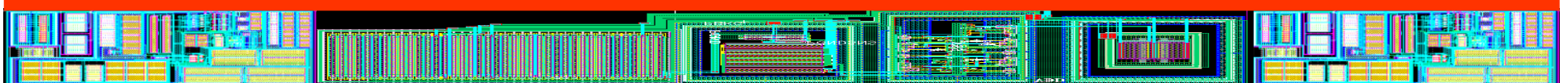
Wenliang Chen, Ph. D.  
Instructor

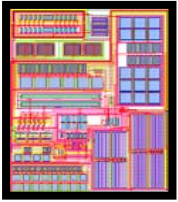




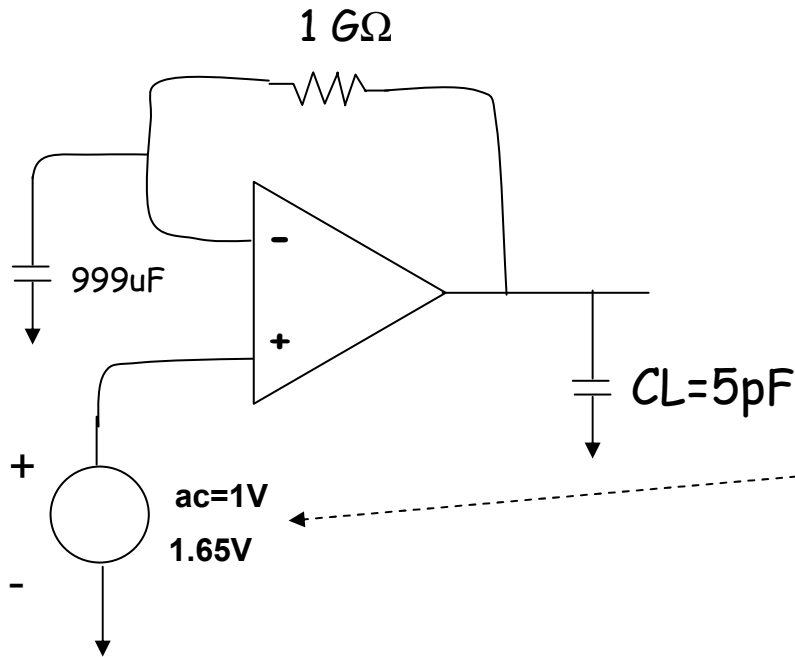
## Op Amps Testings

- Open Loop Gain & Phase Margin (PM)
  - a) ac response
  - b) ac noise
- Step Response
- Slew Rate
- Systematic Offset
- Input Common Mode Range





# Op Amps Testings - AC Response



**Edit Object Properties**

OK Cancel Apply Defaults Previous Next Help

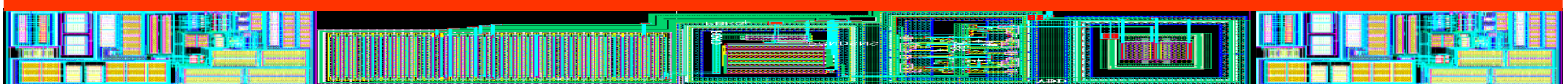
Apply To:

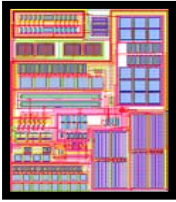
Show:  system  user  CDF

Library Name: NCSU\_Analog\_Parts  
Cell Name: vdc  
View Name: symbol  
Instance Name: V14

User Property	Master Value	Local Value	Display
lvignore	TRUE		off

CDF Parameter	Value	Display
AC magnitude	1 V	off
AC phase		off
DC voltage	1.65 V	off
Noise file name		off
Number of noise/freq pairs	0	off
Temperature coefficient 1		off
Temperature coefficient 2		off
Nominal temperature		off



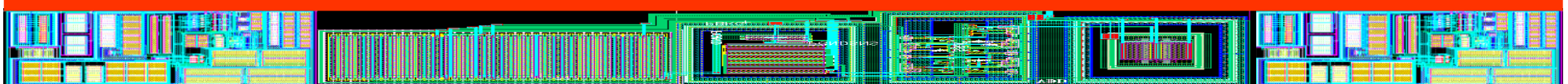
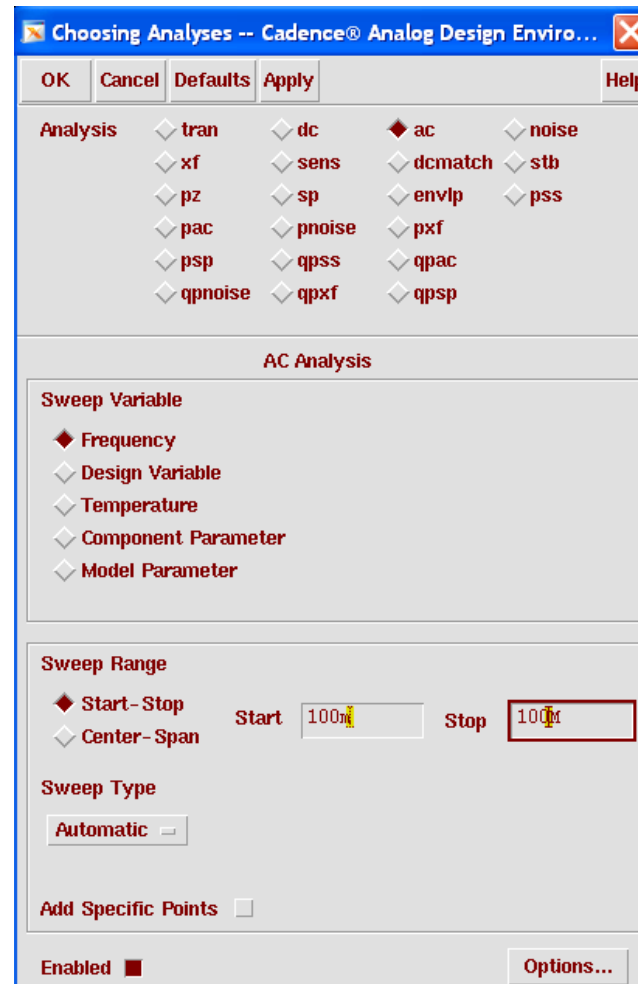


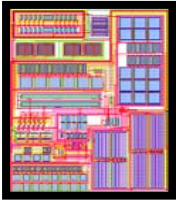
# Op Amps Testings - AC Response

In ADE Window,  
Analyses,  
Select AC Analysis

Key in start and stop  
Frequencies.

Enabled!





# Op Amps Testings - AC Response

The screenshot shows the Cadence Analog Design Environment interface. The main window displays simulation parameters: Status: Ready, T=27.0 C, Simulator: spectre. The menu bar includes Session, Setup, Analyses, Variables, Outputs, Simulation, Results, Tools, and Help. The Results menu is open, showing options like Direct Plot, Print, Annotate, Circuit Conditions, Save, Select, Delete, and Printing/Plotting Options. The AC Magnitude & Phase option is highlighted with a red dashed box.

#	Type	Arguments...
1	dc	t 0
2	ac	100m 1G
3	tran	0 100u

#	Name	Value	#	Name/Signal/Expr	v
1	VG	2.311	1	N11/D	no yes no
2	VDP	2.8	2	P23/D	no yes no
3	VDN	1.5	3	P38/D	no yes no
4	fclk	3K	4	net0506	no allv no
5	VOUT	1	5	net0367	no allv no
			6	P39/D	no yes no

> Results in .../002/w/wxc012100/cadence/simulation/HW4/spectre/schematic

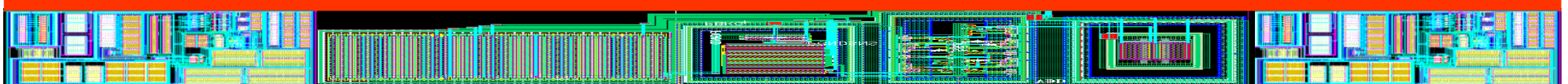
After simulation  
Go to "Results"  
"Direct Plot"  
"AC magnitude & Phase"

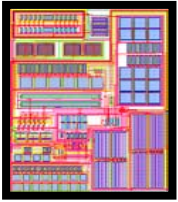
Go to schematic

Select "VOUT"

"Esc"

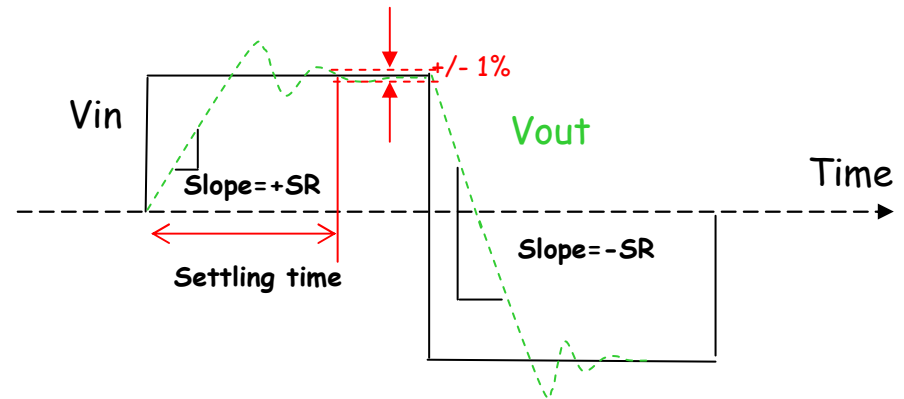
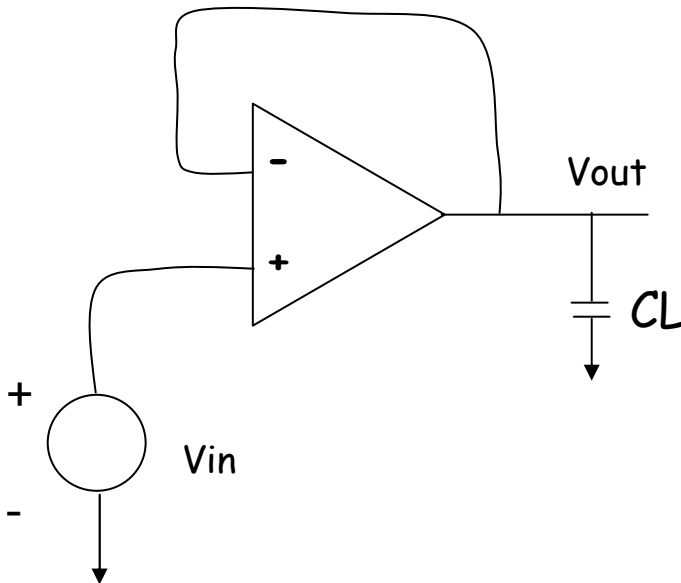
AC response should show up.



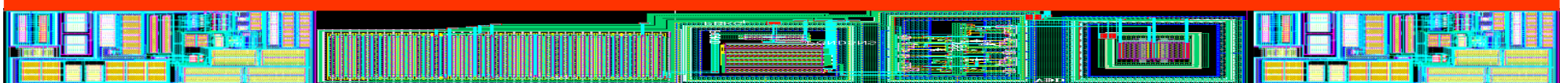


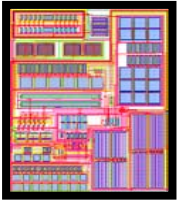
# Op Amps Testings - Slew Rate

Slew Rate  
Transient Simulation



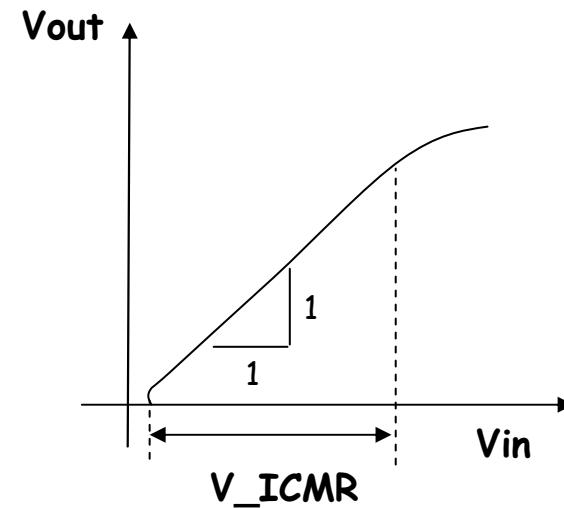
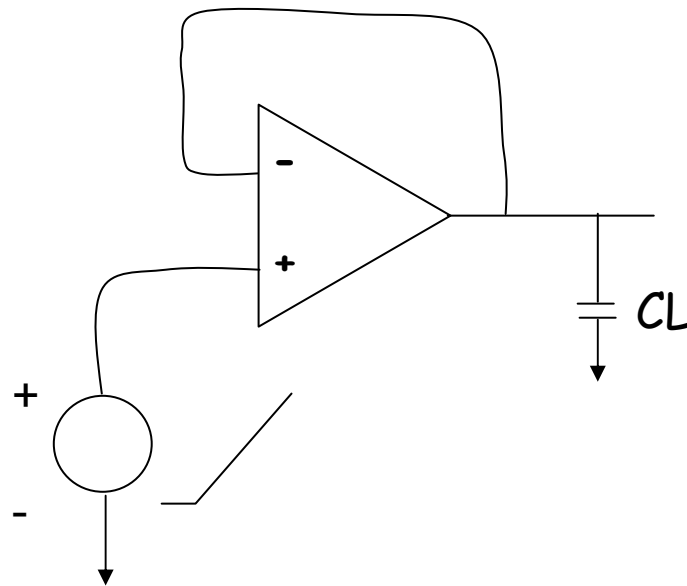
"CMOS Analog Circuit Design" Phillip E. Allen et al, ISBN:0-19-510720-9; p. 426 - 445





# Op Amps Testings - $V_{ICMR}$

Step Response,  
Transient Simulation



"CMOS Analog Circuit Design" Phillip E. Allen et al, ISBN:0-19-510720-9; p. 426 - 445

