

EE618

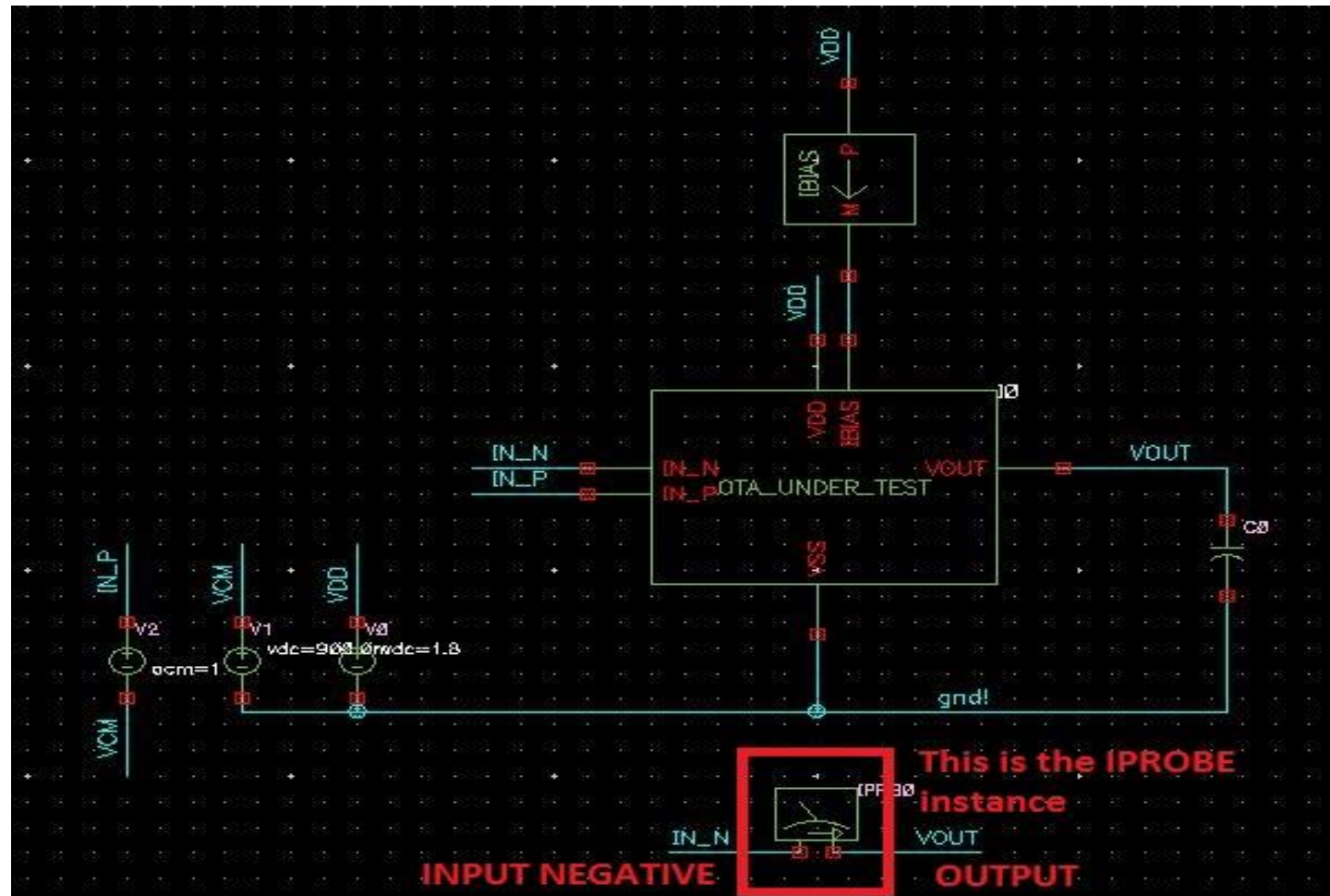
CMOS ANALOG IC DESIGN

STB Analysis In cadence Spectre

Set up the circuit

- Add "IPROBE" instance from "analogLib" library.
- IPROBE acts as "short" for dc and "open" for ac.
- This is useful in finding the LoopGain.
- Adding IPROBE breaks the feedback for ac but maintains dc operating point.
- Connect IPROBE between output node and the negative input of OTA. (fig in next slide)

Set up the circuit



STB Analysis Window

The screenshot shows the 'Choosing Analyses' dialog box for an STB analysis. The window title is 'Choosing Analyses -- ADE L (16)@vlsi32'. The 'Choose stb' section has a grid of radio buttons for various analysis types: stb (selected), pss, pxf, qpnoise, hbac, pz, pac, psp, qpxf, hbnoise, sp, pstb, qpss, qpasp, envlp, pnoise, and hb. The 'Stability Analysis' section has a 'Sweep Variable' section with 'Frequency' selected, and a 'Sweep Range' section with 'Start-Stop' selected. The 'Sweep Type' section has 'Logarithmic' selected. The 'Points Per Decade' section has 'Points Per Decade' selected with a value of 100. The 'Add Specific Points' checkbox is unchecked. The 'Probe Instance/Terminal' field contains '/IPRB0' and a 'Select' button is next to it. At the bottom are 'OK', 'Cancel', 'Defaults', 'Apply', and 'Help' buttons.

Choosing Analyses -- ADE L (16)@vlsi32

Choose stb

☒ stb ☐ pz ☐ sp ☐ envlp
☐ pss ☐ pac ☐ pstb ☐ pnoise
☐ pxf ☐ psp ☐ qpss ☐ qpac
☐ qpnoise ☐ qpxf ☐ qpasp ☐ hb
☐ hbac ☐ hbnoise ☐ hbasp

Stability Analysis

Sweep Variable

☒ Frequency
☐ Design Variable
☐ Temperature
☐ Component Parameter
☐ Model Parameter
☐ None

Sweep Range

☒ Start-Stop ☐ Center-Span

Start Stop 10G

Sweep Type

☒ Logarithmic ☐ Linear

Points Per Decade

☒ Points Per Decade 100
☐ Number of Steps

Add Specific Points ☐

Probe Instance/Terminal

Options same as AC analysis

Click select -> goto schematic -> click on the iprobe instance.

STABILITY Summary report

The screenshot shows the Cadence ADE L (17) interface for the project "OTA_CHARACTERIZATION_TEST TB_STB schematic@vlsi32". The "Results" menu is open, and the "Stability Summary" option is highlighted with a red box. The interface includes a "Design Variables" table, an "Analyses" table, and an "Outputs" table. The status bar at the bottom indicates "Status: Ready", "T=27 C", "Simulator: spectre", and "State: stb".

Design Variables

Name	Value
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Analyses

Type	Enable	Value
1 stb	<input checked="" type="checkbox"/>	1 10G

Outputs

Name/Signal/Expr	Wave	Plot
1 Loop Gain Phase	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2 Loop Gain dB20	<input checked="" type="checkbox"/>	<input type="checkbox"/>

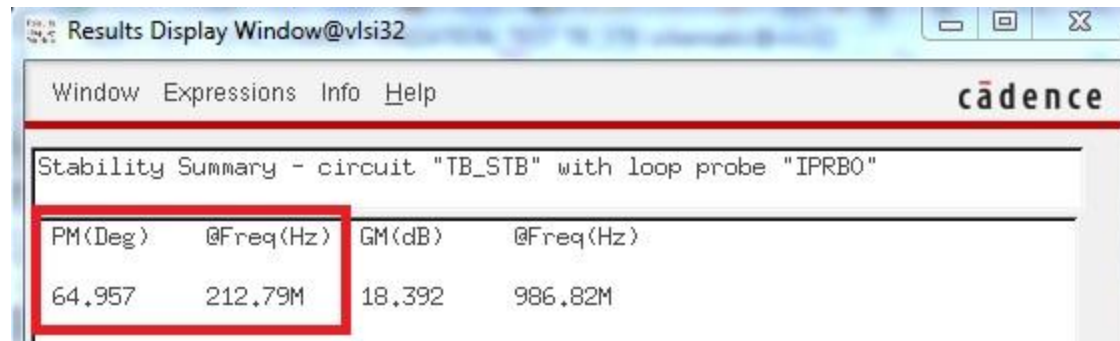
Results Menu

- Plot Outputs
- Direct Plot
- Print
 - Annotate
 - Vector
 - Circuit Conditions ...
 - Violations Display ...
 - Reliability Data
 - EM/IR Data
 - Save ...
 - Select ...
 - Delete ...
 - Printing/Plotting Options ...
- DC Node Voltages
- DC Operating Points
- Model Parameters
- Transient Node Voltages
- Transient Operating Points
- Mismatch Summary ...
- ACmatch Summary ...
- Stability Summary**
- Capacitance Table
- S-Parameter
- Noise Parameters
- Noise Summary ...
- AC Distortion Summary
- PAC Distortion Summary
- HBAC Distortion Summary
- Pole-Zero Summary ...
- Sensitivities
- MDL Measures ...

Status Bar

83(140) DC Node Voltages | Status: Ready | T=27 C | Simulator: spectre | State: stb

Example Stability Report

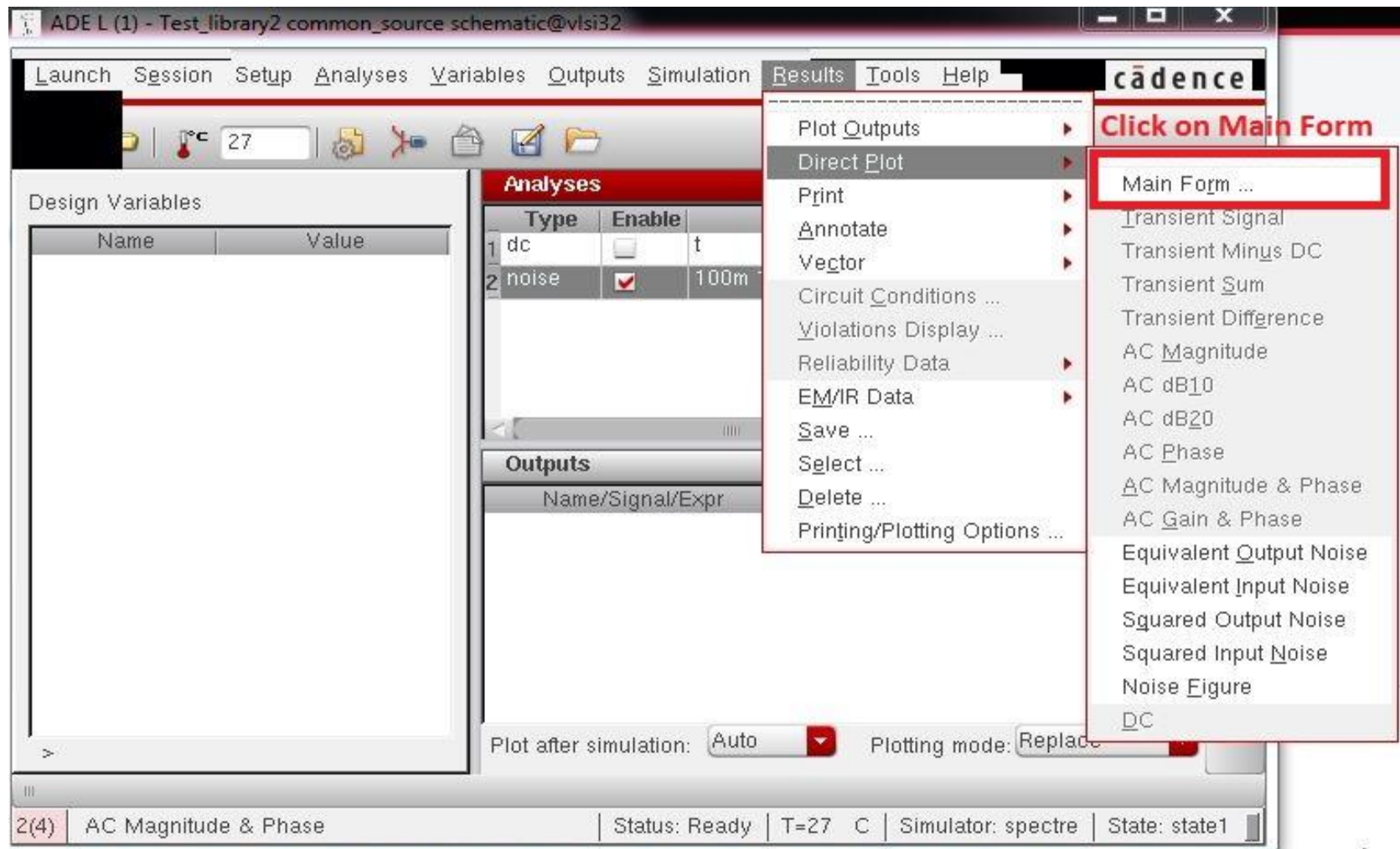


The screenshot shows a 'Results Display Window' from Cadence. The window title is 'Results Display Window@vlsi32'. The menu bar includes 'Window', 'Expressions', 'Info', and 'Help'. The 'cadence' logo is in the top right. The main content area is titled 'Stability Summary - circuit "TB_STB" with loop probe "IPRB0"'. Below this title is a table with four columns: 'PM(Deg)', '@Freq(Hz)', 'GM(dB)', and '@Freq(Hz)'. The first row of data shows '64.957', '212.79M', '18.392', and '986.82M'. A red rectangle highlights the first two columns and their data values.

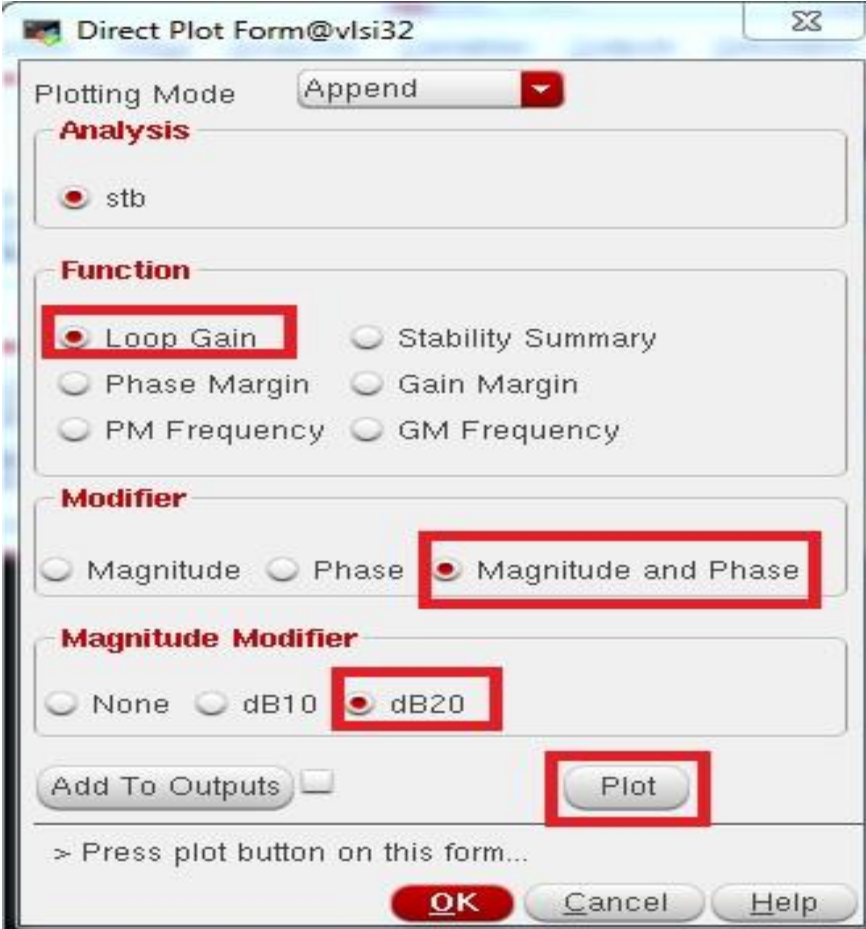
PM(Deg)	@Freq(Hz)	GM(dB)	@Freq(Hz)
64.957	212.79M	18.392	986.82M

- Gives Phase Margin, Gain crossover frequency (Unity gain frequency)
- Also Gain Margin and Phase crossover frequency

To Plot Loop gain



To Plot Loop gain



Direct Plot Form@vlsi32

Plotting Mode: Append

Analysis

☒ stb

Function

☒ Loop Gain ☐ Stability Summary
☐ Phase Margin ☐ Gain Margin
☐ PM Frequency ☐ GM Frequency

Modifier

☐ Magnitude ☐ Phase ☒ Magnitude and Phase

Magnitude Modifier

☐ None ☐ dB10 ☒ dB20

Add To Outputs ☐

Plot

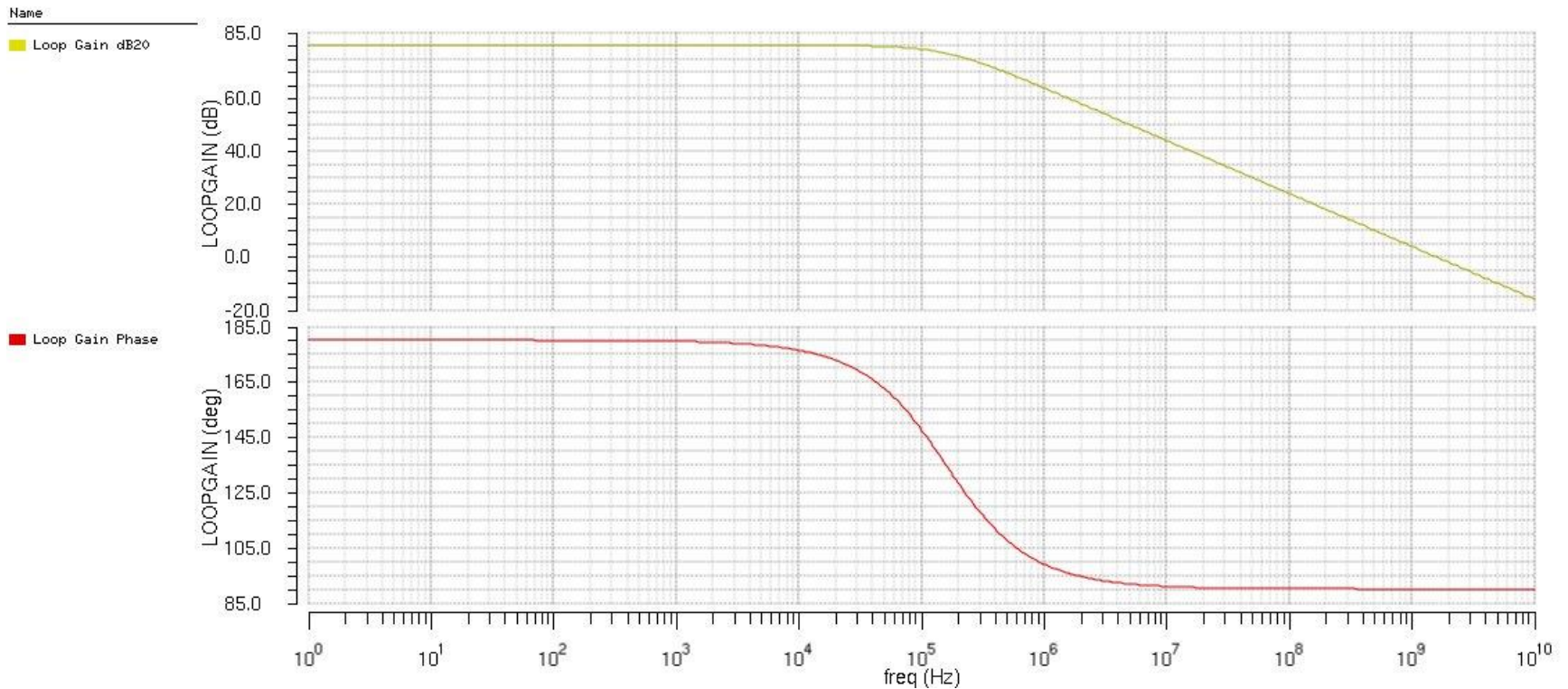
> Press plot button on this form...

OK Cancel Help

Example Loop gain Plots

Loop Gain Phase: Loop Gain dB20

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END