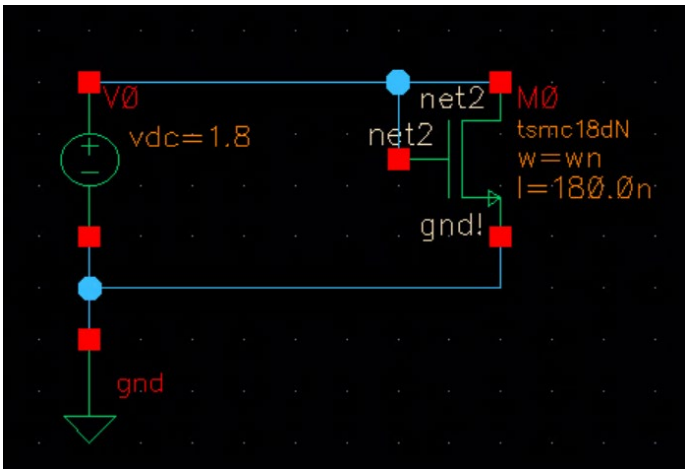
ECE 546 HOMEWORK No 10 Due Friday, May 1, 2026

PART I - Solution

* Instead of using the V/I curve to calculate the on-resistance, this solution used a built-in "*ron*" formula to quickly extract this value from the transistors. Same result can be achieved by following the formula in part 1 of HW9.

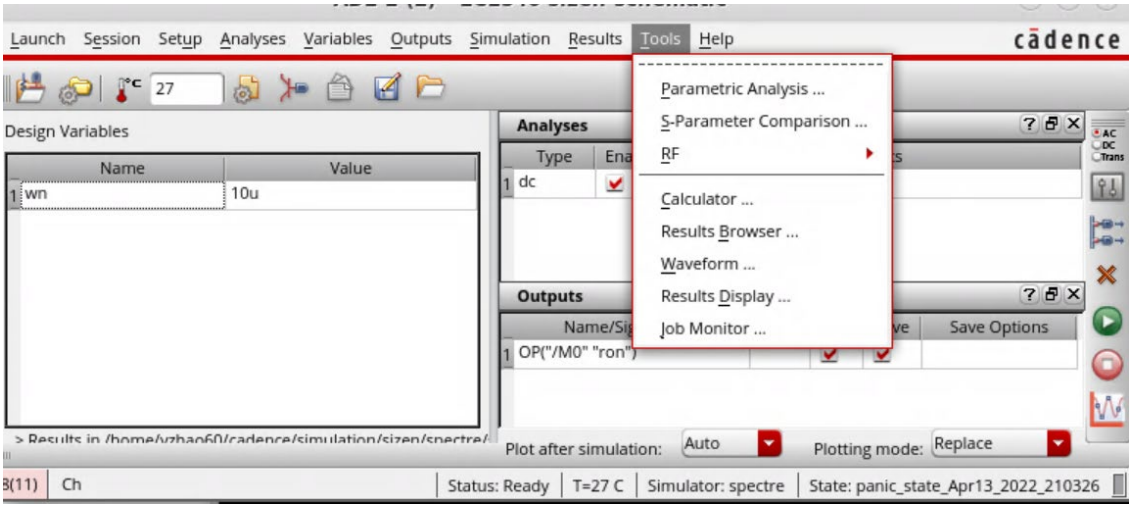
1. In order to match the inverter to 50 ohms, the pmos and nmos need to sized separately.

   Here is an example of sizing nmos:



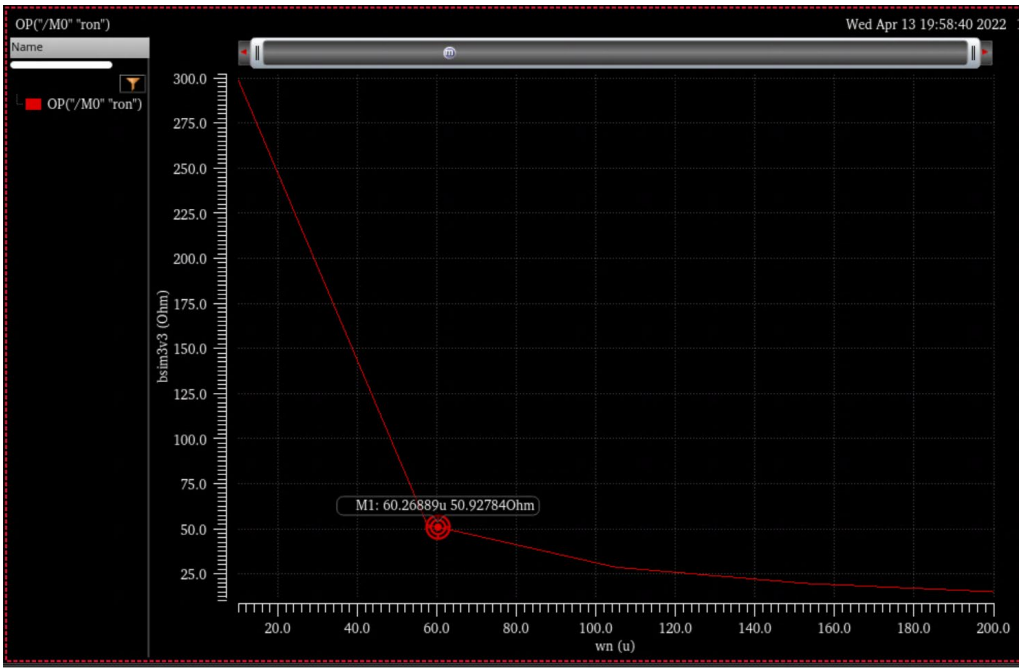
← (The width is a variable.)

   Then the width of the nmos is swept from 10 um to 200 um in parametric analysis:

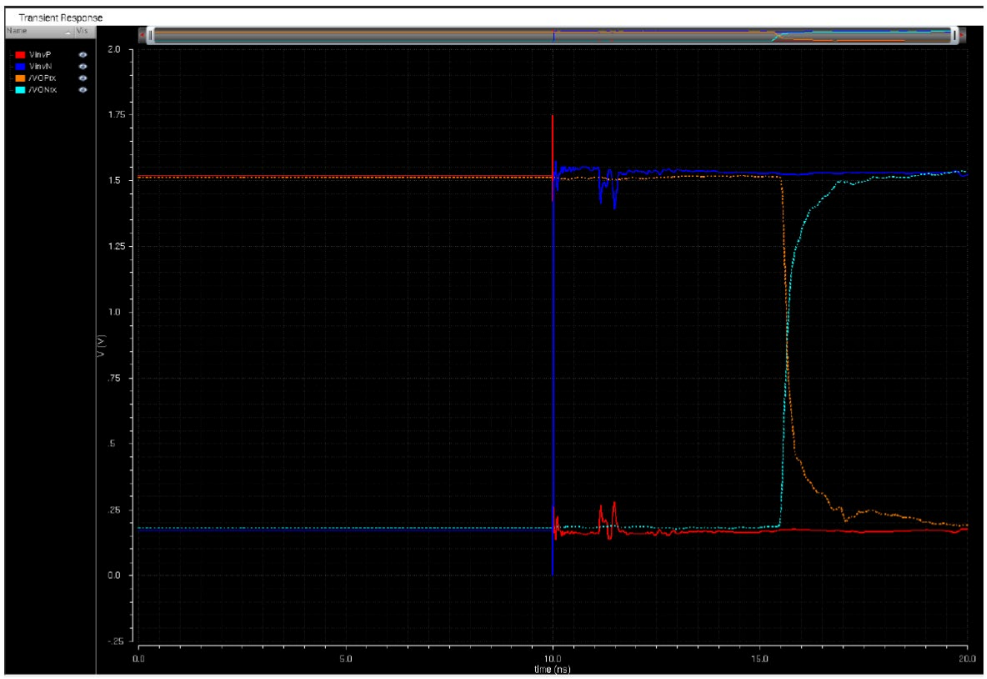


Note the output function is *OP("/MO" "ron")*, a faster way to get the on-resistance.

After the sweep, the width of NMOS = 60.27 um. Similar setup can be used to find the width of the PMOS, which gives 117.62 um.

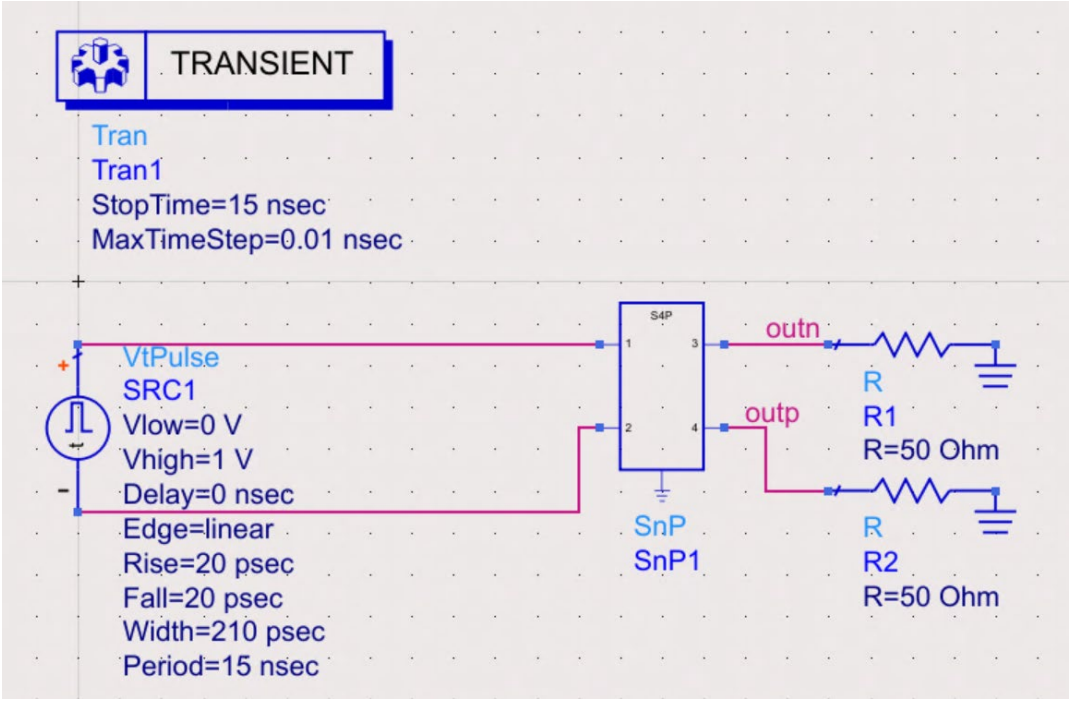


2. Update the inverter symbol and re-simulate the differential channel. With the same 1.8 V differential excitation, the channel's inputs and outputs are shown below.

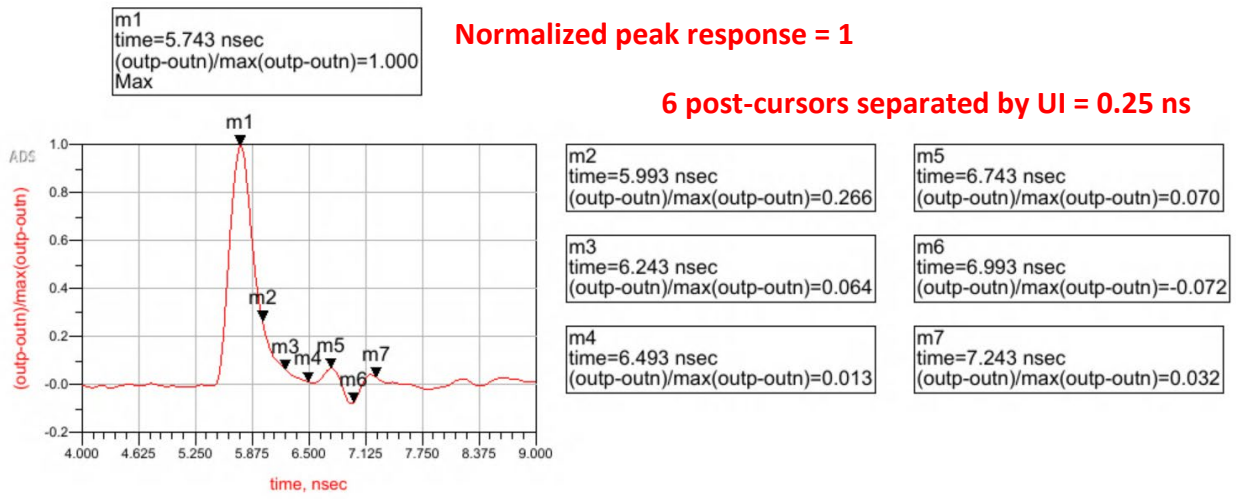


PART II - Solution

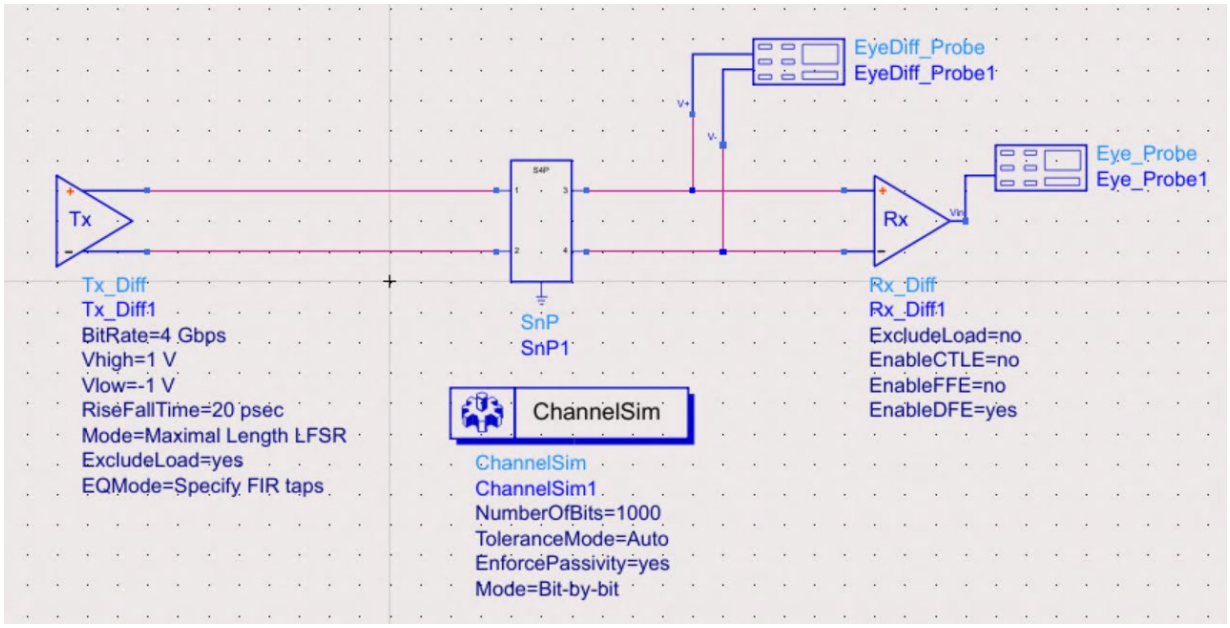
1. Extract pulse response of the channel (Schematic)

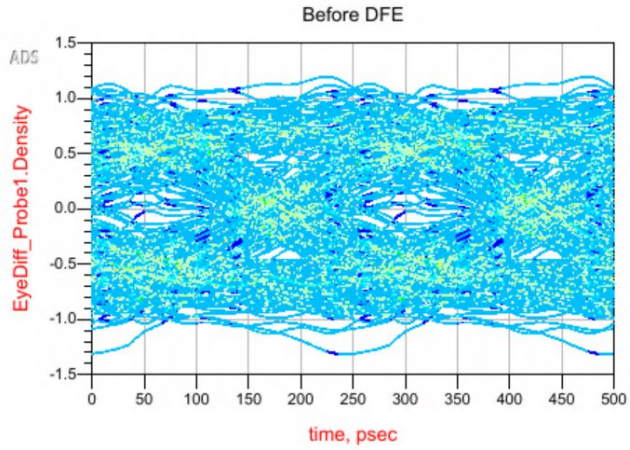


2. Find the post cursors (Data Display)

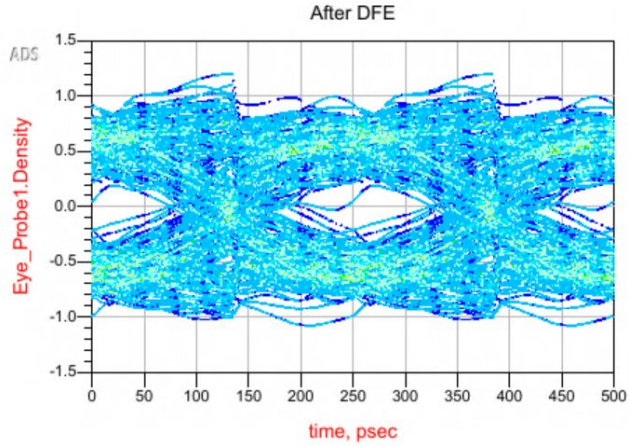


3. Adaptive DFE equalization in ADS (Schematic & Data Display)





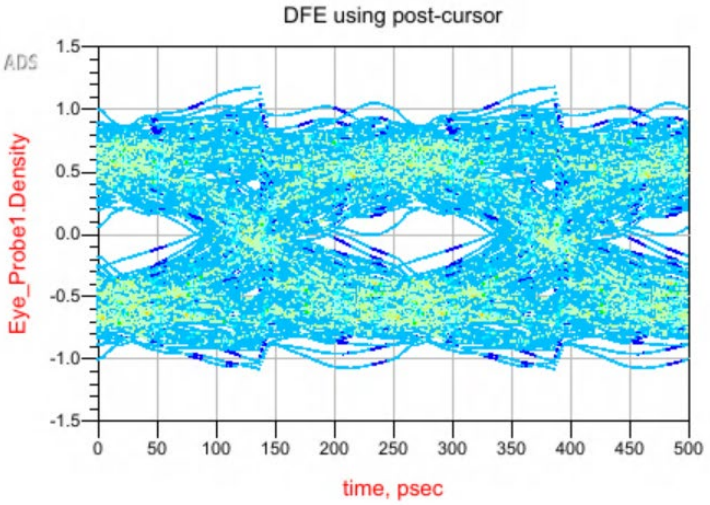
measurement	EyeDiff_Probe1.Summary
Level1	0.572
Level0	-0.570
Height	0.000
Width	0.000



index	DFE_Taps
1.000	0.144
2.000	0.030
3.000	-0.002
4.000	0.029
5.000	-0.058
6.000	0.019

measurement	Eye_Probe1.Summary
Level1	0.574
Level0	-0.568
Height	0.224
Width	1.138E-10

4. Validate the post cursors (Data Display)



index	DFE_Taps
1.000	0.133
2.000	0.032
3.000	0.006
4.000	0.035
5.000	-0.036
6.000	0.016

measurement	...Probe1.Summary
Level1	0.571
Level0	-0.569
Height	0.223
Width	1.550E-10

DFE tap value comparison

Tap #	Adaptive (reference)	Manual (post-cursor)	Match (%)
1	0.144	0.133	92.36
2	0.030	0.032	93.33
3	-0.002	0.006	LOW
4	0.029	0.035	79.31
5	-0.058	-0.036	62.07
6	0.019	0.016	84.21

Eye summary comparison

Measurement	Adaptive (reference)	Manual (post-cursor)	Match (%)
Level 1	0.574 V	0.571V	99.48
Level 0	-0.568 V	-0.569 V	99.82
Eye Height	0.224 V	0.223 V	99.55
Eye Width	114 ps	155 ps	*64

Overall, the taps calculated from pulse response successfully opens the eye.
*They even outperformed the adaptive DFE in terms of eye width.