

## Simulation Exercise 2

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1. Design an amplifier with biasing to meet the following specifications:

- Gain: 20 dB
- Source resistance: 1 k $\Omega$
- Load resistance: 50  $\Omega$
- Frequency: 1 kHz

(Given: One voltage source of 1.1 V and current source of 10  $\mu$ A.)

Objective is to meet the above specifications while maximizing the signal swing. You can cascade multiple stages if needed.

Submit the following:

- Hand calculation for choosing the device size and biasing elements. Use the square-law model extracted in the previous exercise. Final values can be changed based on simulation.
- Schematic screenshot and final element values.
- Total harmonic distortion (THD) measures linearity of a system,

$$THD = \frac{\sqrt{V_2^2 + V_3^2 + \dots + V_n^2}}{V_1}$$

where,  $V_k$  is the rms value of  $k^{th}$  harmonic.

Calculate output voltage THD (in %) using LTspice for input amplitude of 1 mV and 50 mV. Attach output FFT plots also.

- Frequency response from 10 Hz to 100 kHz.
- DC power consumed by the amplifier.
- Upload LTspice schematic as a separate file.