Electronics & Comm. Dept.
Faculty of Engineering
Cairo University
2024-2025

قسم الالكترونيات و الاتصالات
كلية الهندسة
جامعة القاهرة

ELC4005: Selected Topics in Electronics I
EECS331: Advanced Topics in Electronics I
(Project 1)

Use TSMC 65nm to design a 2-stage single-ended LNA for 6G applications covering the 10-15GHz band. Choose a suitable architecture for the LNA to achieve a 20dB gain across the full frequency range and NF<2.5dB. The LNA return losses S_{11} and S_{22} should be <-10dB. Also, the LNA should achieve an IIP3 of -15dBm. Design the bias circuit required to generate the different bias voltages and currents for the LNA, assume a single 0.2mA reference current is available to bias the LNA.

Notes:

1. All inductors should use PDK models. If desired inductor values are not achievable a lumped model can be used instead
2. Device parasitics has to be modeled using RC extraction
3. Show the LNA schematics including device sizes, and indicate the bias point of the devices on the LNA schematic
4. Show plots for the LNA gain, NF, NFmin, S_{11}, S_{22}, IIP3, and IP1dB versus frequency
5. Repeat 4 across PVT corners (typical, slow hot low supply, fast cold high supply)
   - Cold =-40ºC, Hot =85ºC
   - High/low supply = +/- 10%
6. Show plots for the LNA noise, load, & source stability circles for the typical corner at 15GHz
7. Show plots for the K-stability factor across corners
8. Summarize in table format all the LNA achieved specs (a sample spec table is shown below)
9. Include the testbench used to generate the results

Assignment due date is **6th Dec 2024**.

	Spec.	Slow	TYP	Fast	Unit
Gain					dB
1dB BW (F_{low} & F_{high})					GHz
NF					dB
IIP3					dBm
IP_{1dB}					dBm

S_{11}					dB
S_{22}					dB
Power consumption					mW