CET 323	VAN NGUYEN	September 13th 2020

LAB

LAB_ 01: Field Effect Transistor (FET) Characteristic Curves.

We did the simulation of JFET characteristic functions by using LTspice program with DC sweep analysis. DC sweep analysis sweeps the DC voltage of the input signal of the electronic circuit and plots the resulting values of the output signal. The output signal can be either voltage or current depending on the analysis goals. See the attached schematic for your memory.

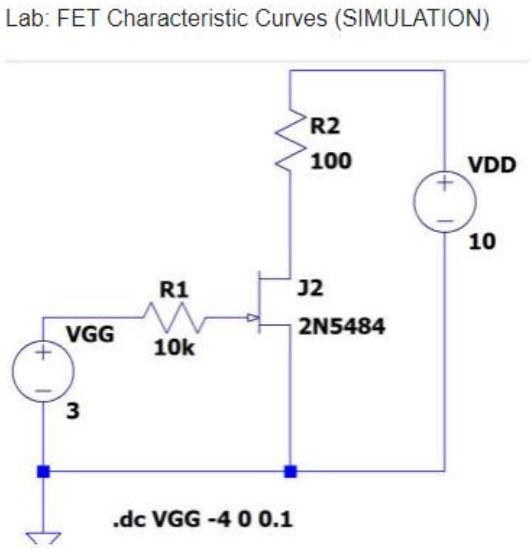

Figure. 1: Transfer characteristic curve simulation

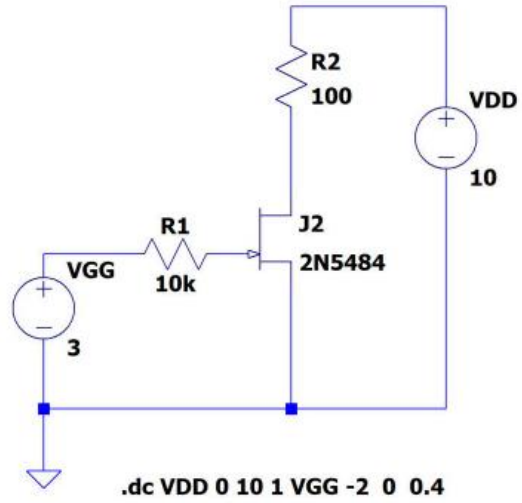

Figure. 2: Drain characteristic curve simulation

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01. Objectives:

Brief overview of laboratory objectives.

Laboratory is a place to perform in the lab experiments such as measuring, analyzing, defining, testing, and running computer software that simulates electronic circuits(as such as LTSpice XVII) to correct the correct operation of the circuit before production. . (Collectively referred to as experiment). Made for scientific analysis, evaluation, and research purposes.

02.Data collection procedure:

What kinds of circuit schematic were used?

- Using LTspice is an analog electronic circuit simulator computer software.
- Field Effect Transistor (FET_2N5484) Characteristic Curves.(simulator)

What kinds of simulation command were specified?

- *Choose the simulation equipment.*
  * File -> New Schematic (Ctrl+N)
  * Edit -> Resistor (N) R_1 ; Ctrl+R -> *Horizontal shift* .
  * Edit -> Resistor (N) R_2
  * Edit -> place GND (G)
  * Edit -> Component (F_2) → Voltage (V_{DD})
  * Edit -> Component (F_2) → Voltage (V_{GG})
  * Edit -> Component (F_2) → nJF (J_2) ;

    Right click at **nJF** => Dialog-J1 , Click " Pick New JFET" -> Choose " **2N5484**" -> OK

LAB_ 01: Field Effect Transistor (FET) Characteristic Curves.

* Edit -> Draw wire (F_3) → Draw the circuit diagram as figure 1.

- Change Edit for label & value of components.
  - * Right click at component need to change and edit.
  - * Can use: Edit-> move (F_7) & Edit -> Delete (F_5)
- Choose value for the circuit.
  - * From the toolbar: Simulate (or right click) -> Edit simulation.

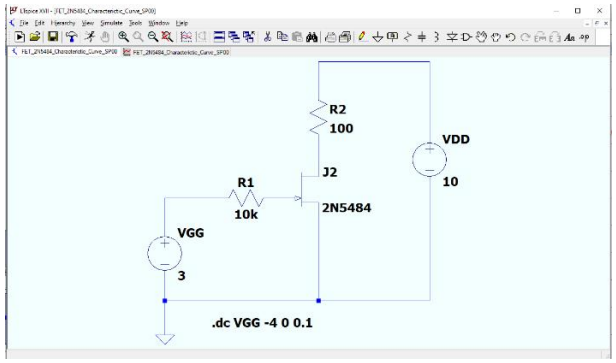


Figure 1: Transfer characteristic curve simulation

=> a dialog box Edit simulation Command open.

Click **DC sweep -> 1st Source :**

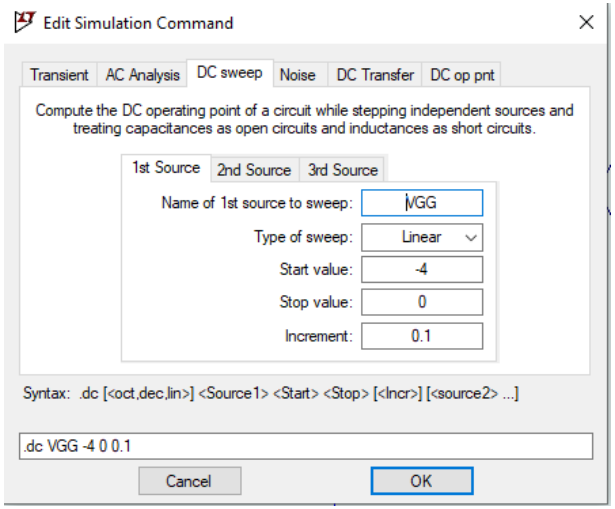
* Name of 1st source to sweep : VGG

* Type of sweep : Linear

* Start value : - 4

* Stop value : 0

* Increment : 0.1 -> OK



- File -> Save as … with name is:

  "*FET_2N548_Characterictic_Curve_SP00.asc*"
- Run the program.

* Simulate -> Run &

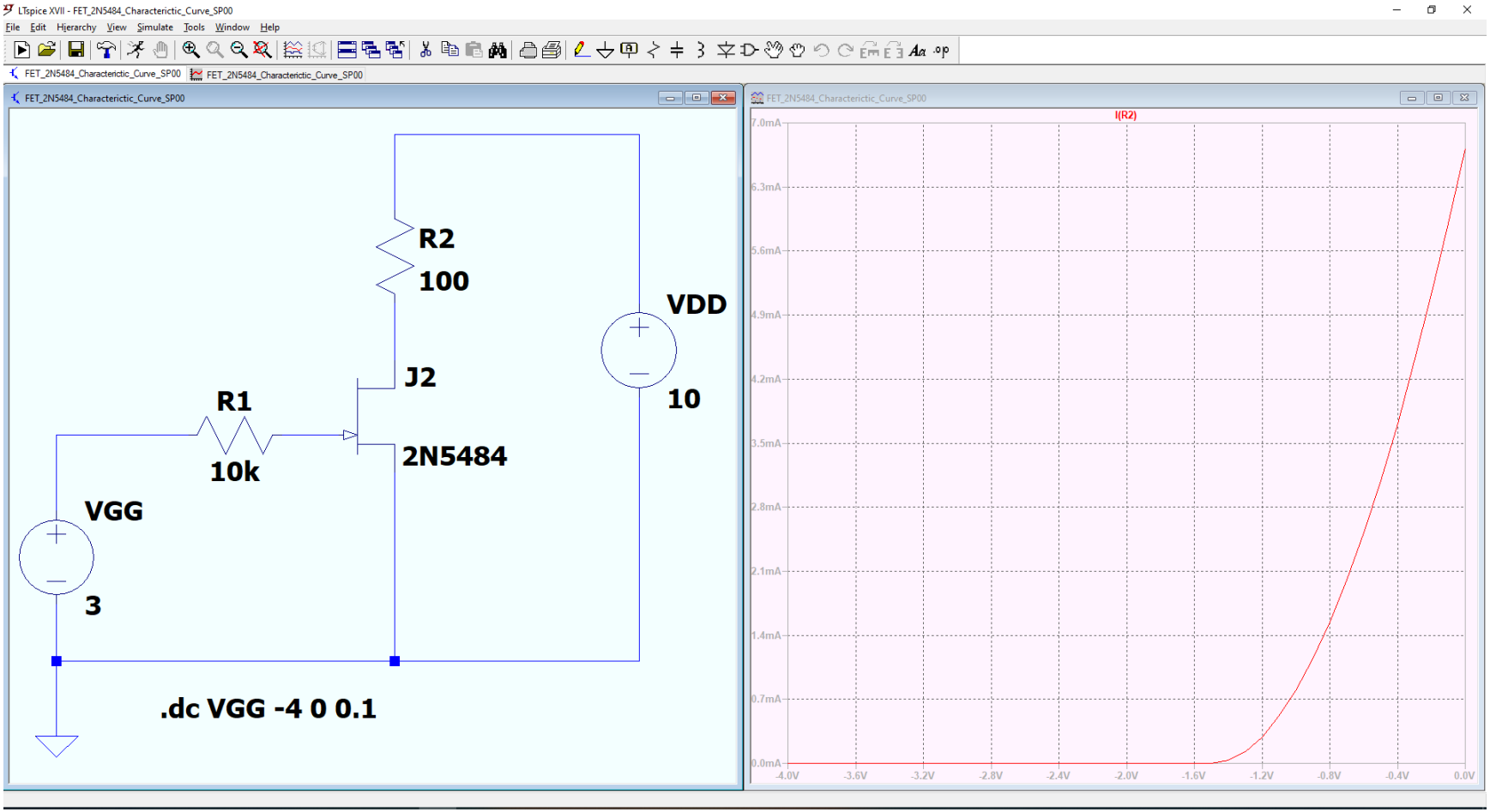
* Click on Resistor R_2

* Window -> Tile vertically

LAB

LAB_ 01: Field Effect Transistor (FET) Characteristic Curves.

, => The graph "SP00.asc" has the form



LAB

LAB_ 01: Field Effect Transistor (FET) Characteristic Curves.

- Create a new schematic "SP01.asc"

  File -> Save as … with name is:

  "*FET_2N548_Characterictic_Curve_SP01.asc*"
- Open simulation Command
- Click **DC sweep ->**

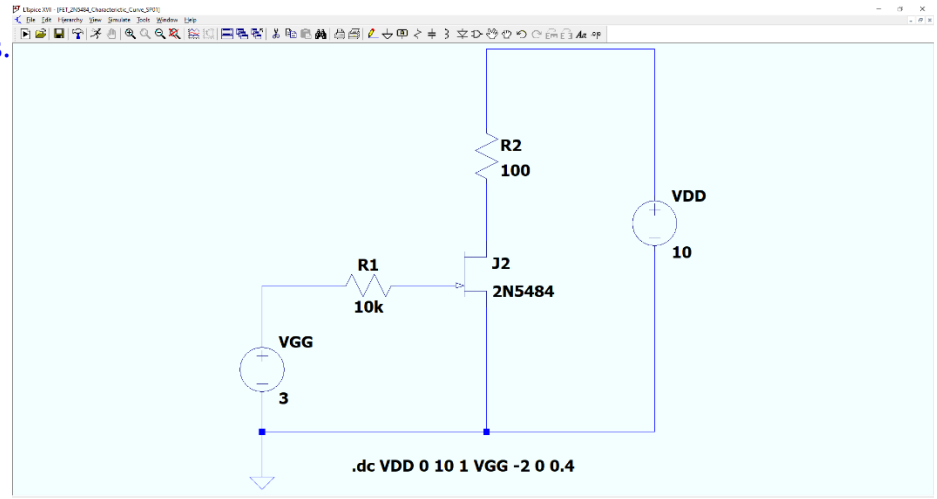


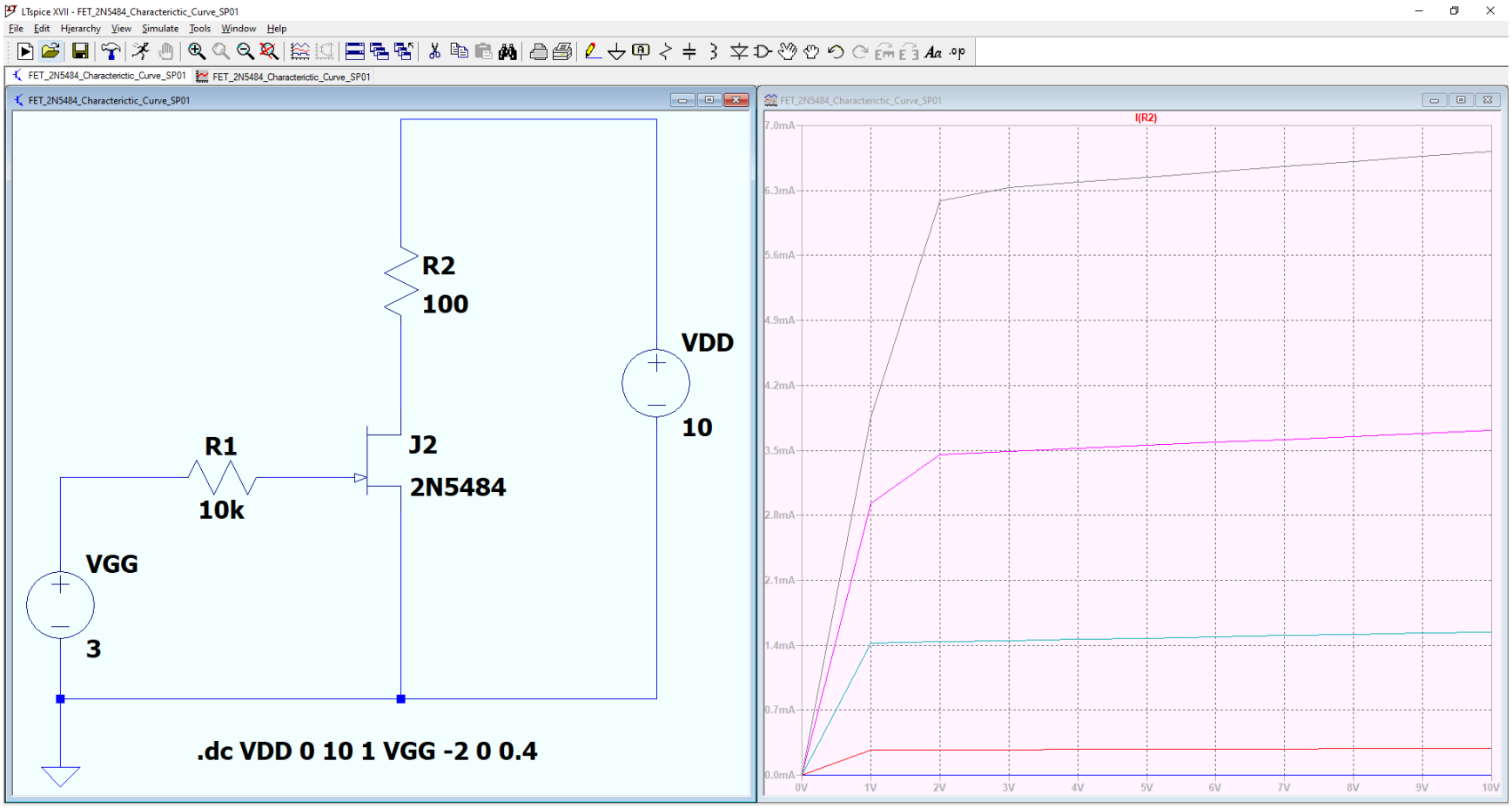
Figure 2 : Drain characteristic curve simulation

1st Source :	**2nd Source :**
* Name of 1st source to sweep : VDD	* Name of 2nd source to sweep : VGG
* Type of sweep : Linear	* Type of sweep : Linear
* Start value : 0	* Start value : - 2
* Stop value : 10	* Stop value : 0
* Increment : 1	* Increment : 0.4

LAB

LAB_ 01: Field Effect Transistor (FET) Characteristic Curves

=> The graph "SP01.asc" has the form



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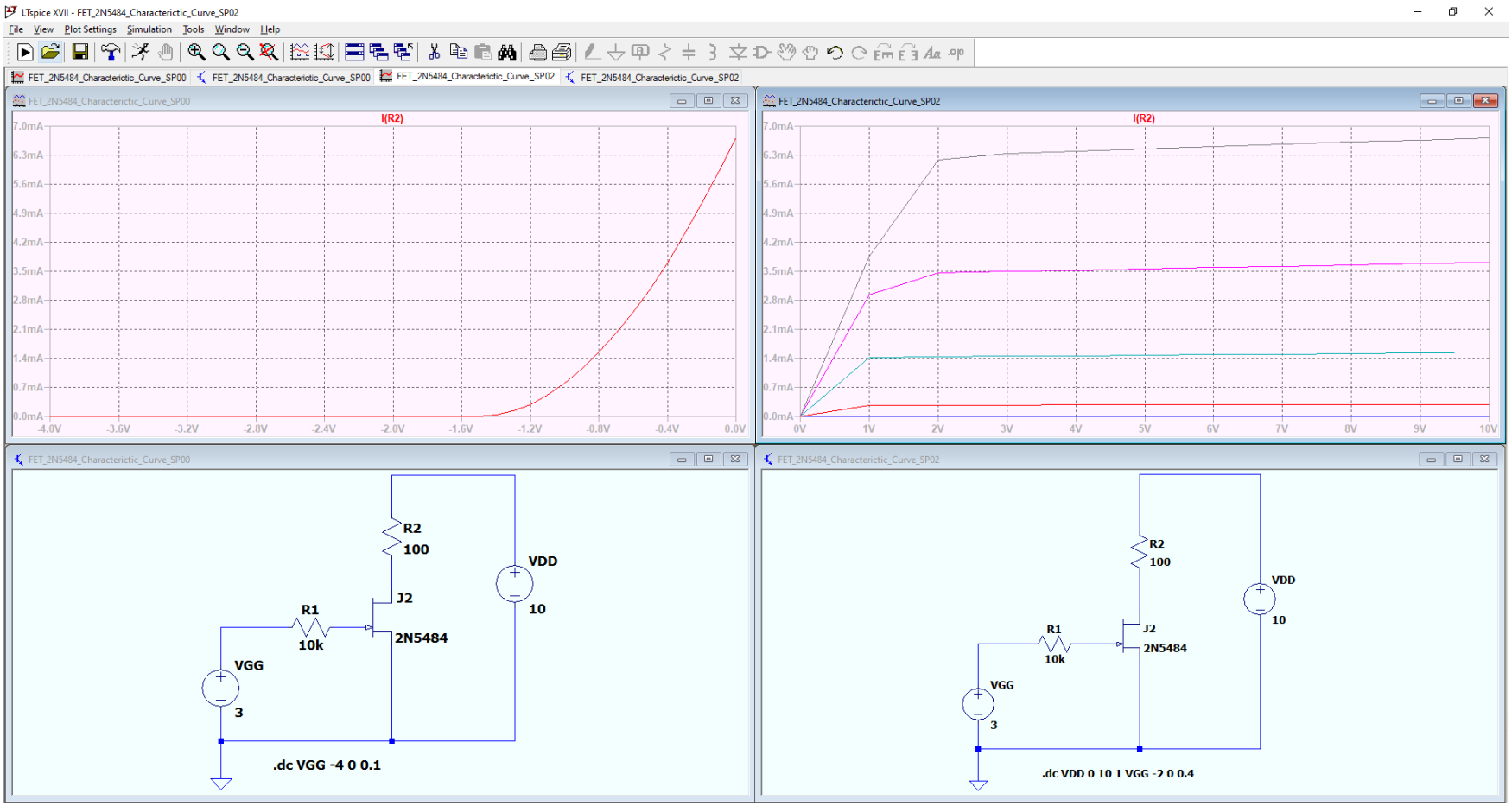
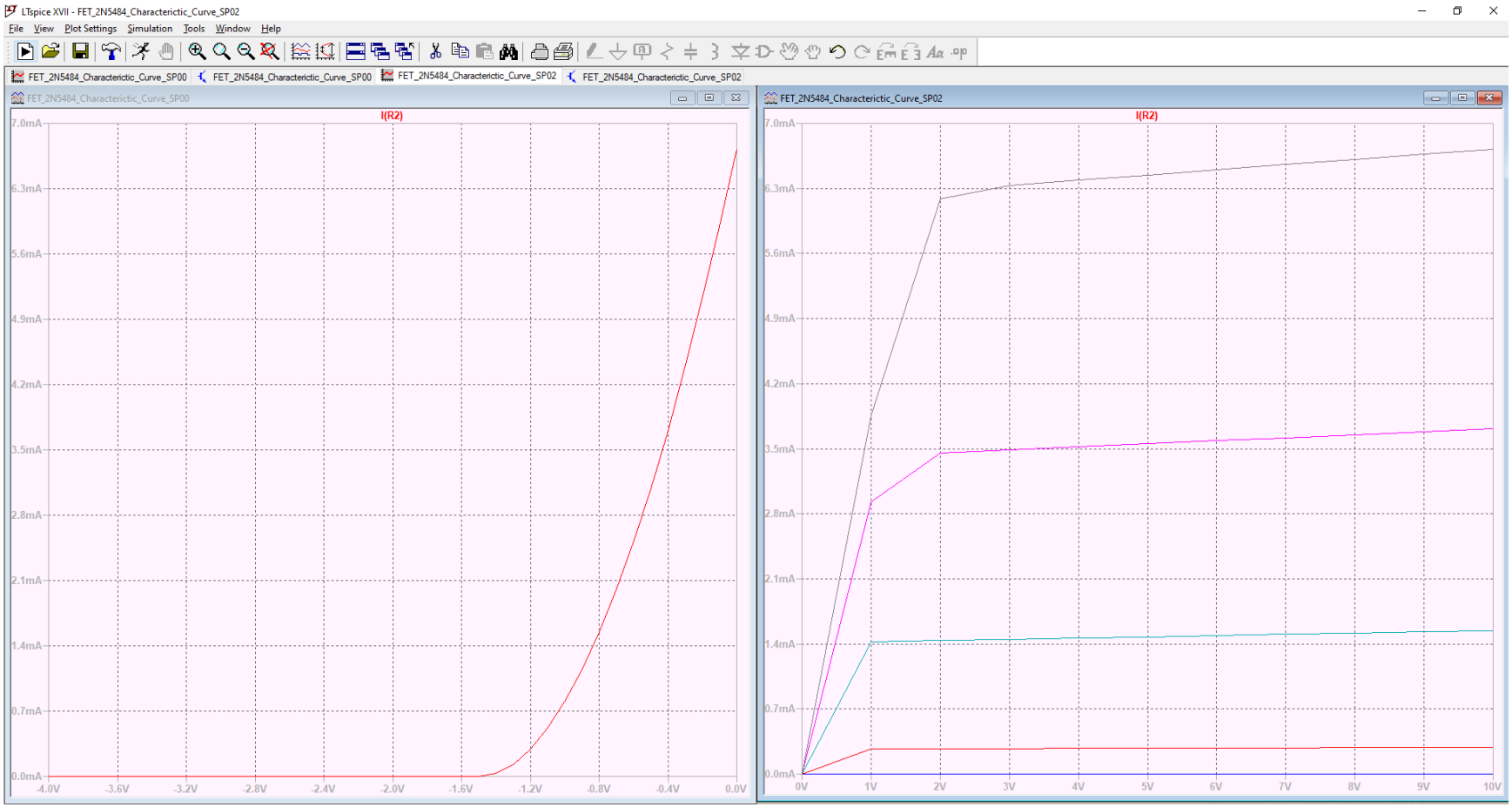
LAB **LAB_ 01**: Field Effect Transistor (FET) Characteristic Curves

- Create a new schematic "SP02.asc with name is: "*FET_2N548_Characterictic_Curve_SP02.asc*"
- Open "SP00.asc" and "SP01.asc".



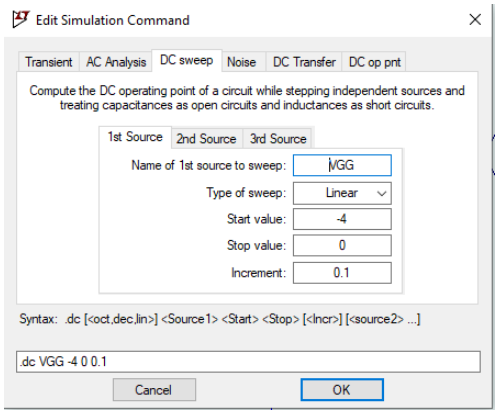
LAB **LAB_ 01**: Field Effect Transistor (FET) Characteristic Curves

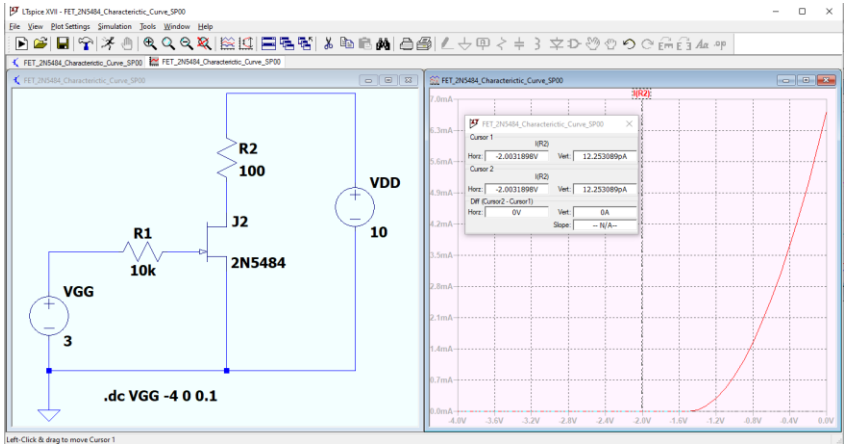


LAB **LAB_ 01**: Field Effect Transistor (FET) Characteristic Curves

03. Data analysis:

Explain your simulation results with proper legends (e.g., X-axis label, Y-axis label, Units of values, etc.)
Identify relevant theory, formulas, diagrams, etc. explained in textbook.





This is a circuit diagram simulation the characteristic functions of JFET.

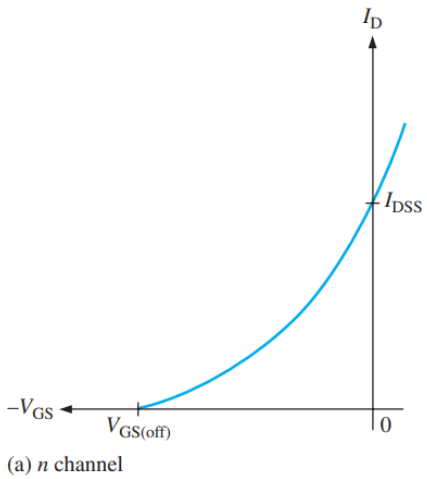
* Look at electronic circuit schematic, the line below shows us know ".dc VGG -4 0 1.1 "

. dc is the current sweeping through the resistor R2 equal to the voltage **VGG (** *Name of 1st source to sweep*) and starts at **-4** value (*Start value*) of the horizontal (VGG) axis of the chart.

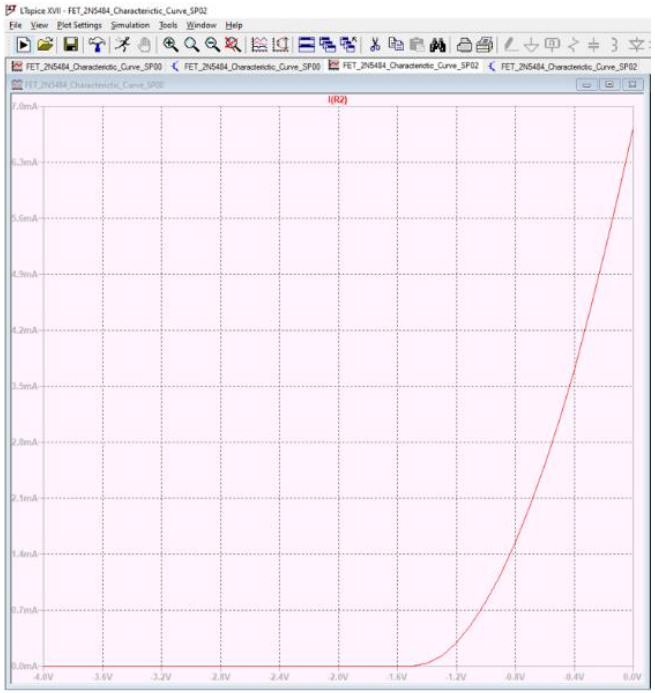
***** It will be ascending un till reach to **0** value (*Stop value*) then it will stop. that is the endpoint of graph. (VGG= 0.0V).

***** The histogram will increase by **0.1** units (*increment*) of the starting value "-4". It means the unit of the horizontal axis will divide based on 0.1 units of -4 (-4 + 0.4 = - 3.6, -3.6 + 0.4 = -3.2; ...until ... 0.0 V)

How is your data similar or dissimilar to the textbook contents? Briefly compare them.



(a) *n* channel



* Comparing two graphs of textbook and of in the simulation, we see they are alike.

The same n-channel. When voltage VGG, increasing to 0.0 V (VGG = off) then electric current (IDD) reach to maximum IDD = I DSS.

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04. Interpretation of findings

Briefly interpret the findings in this lab.

Easy to use and operate on the simulation circuit, Can change, modify the value of the components on the circuit, to suit the analysis, evaluation, and practice, even graphing with results fast.