

**CHARACTERIZATION OF  
HIGH ELECTRON MOBILITY TRANSISTOR  
(HEMT)**

This thesis is presented in partial fulfillment for the award of the  
Bachelor of Engineering (Hons.) in Electrical  
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## ABSTRACT

In this project, we shall attempt to reproduce simultaneously the DC and RF characteristics of the HEMT using a unique set of physical device parameters. The technology that used in this project is equal to 0.5  $\mu\text{m}$ . In this report, a DC models for HEMT's will be represented. This included the Id-Vg characteristics and other topics related to the performance of DC HEMT. Then the RF characteristics for HEMT also discussed in this report. The procedure allows important parameters used, including the donor concentration, doped layer thickness, spacer layer thickness, physical gate length, source resistance, drain resistance, and the saturated electron velocity in the two dimensional electron gas (2DEG) and in the doped AlGaAs to be obtained.

Finally, all the result and models including DC model, AC model, velocity-field model for 2DEG and also phenomenological mobility modeling for HEMT are obtained at the end of the project. The DC model (Id-Vg characteristic) then will be compared with result from Silvaco to measure the accurateness of the model.

There are slightly different between the result from the theoretical (Python) and Silvaco. In addition, the result from Silvaco is much more accurate compare with the theoretical because there is some element that does not contained in the theoretical part liked temperature, pressure, humidity, types of fabrication and others.

Some improvement can be made to the HEMT. By reducing the gate length, it will provide better RF characteristics for HEMT. The future HEMT can improve all the characteristics of HEMT to make the devices give the best performance due to the applications.

## **Acknowledgment**

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# CHAPTER 1

## INTRODUCTION

### 1.0 REVIEW

In this chapter, the overall presentation of this thesis included the background of the high electron mobility transistor, the objective of this project, the scope of work that need to be done in this project and lastly the organization of the thesis. All the information regarding to the high electron mobility transistor will be provided. All of this information is very important in order to get the deep understanding about the HEMT. This chapter included the explanation of HEMT, construction of HEMT, the operation of HEMT, the applications in real world and also the advantages of HEMT compared to normal FETs.

### 1.1 BACKGROUND

#### 1.1.1 HIGH ELECTRON MOBILITY TRANSISTOR (HEMT)

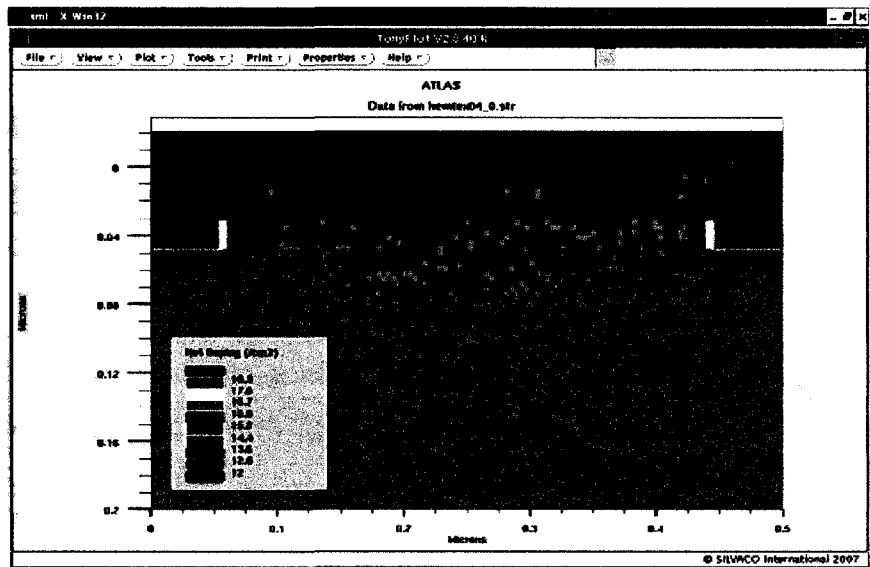


Figure 1 Example of HEMT from Silvaco