

## Lab # 09 Power System Analysis Toolbox (PSAT)

### Aim:

In this lab we will learn about how to use PSAT. In this lab we will give a simple introduction to get you “up and running” with the program.

### PSAT:

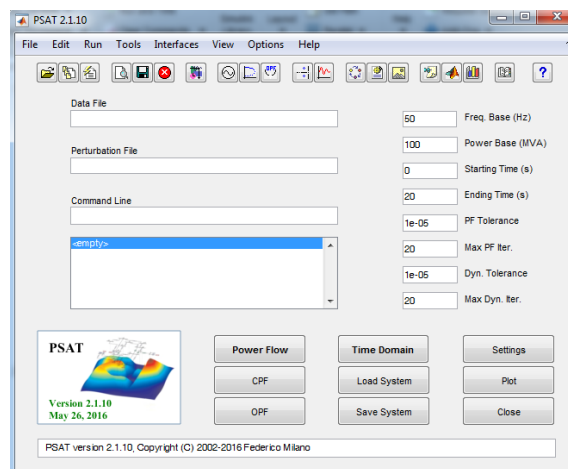
PSAT is an open source power system analysis toolbox for Matlab developed by Dr. Federico Milano. It can be used for power system analysis and control, learning, education and research.

### Executing the PSAT in GUI (Graphical user interface) Mode:

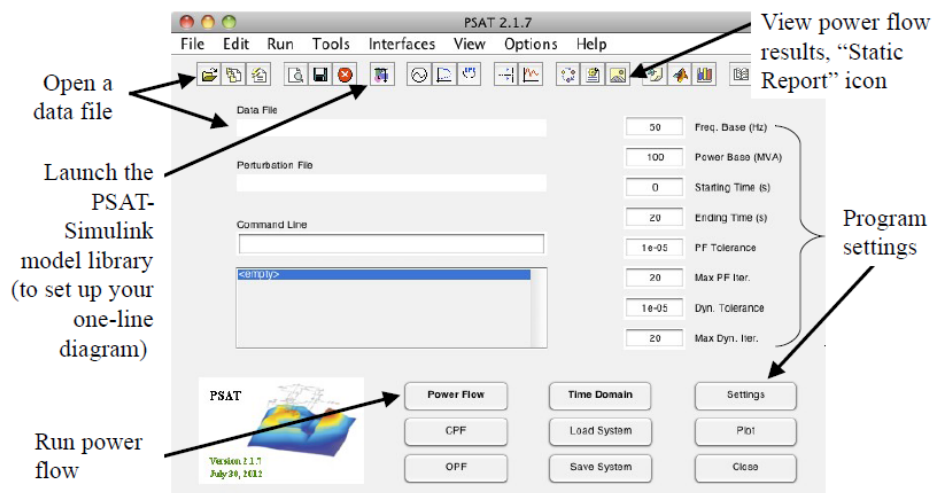
Once PSAT has been installed type in the Matlab Command Window:

```
>> psat
```

After a splash window, the “Main GUI” will appear in your screen:



### Options and settings you will be using:



## Case Study and Data Preparation:

You should prepare your system data in tables for easy input into PSAT:

### System Data:

Bus	V	P <sub>g</sub> (KW)	Q <sub>g</sub> (KVAR)	P <sub>d</sub> (KW)	Q <sub>d</sub> (KVAR)	Type
1	1.00	-	-	50	30.99	Slack
2	-	0	0	170	105.35	PQ
3	-	0	0	200	123.94	PQ
4	1.02	318	-	80	49.58	PV

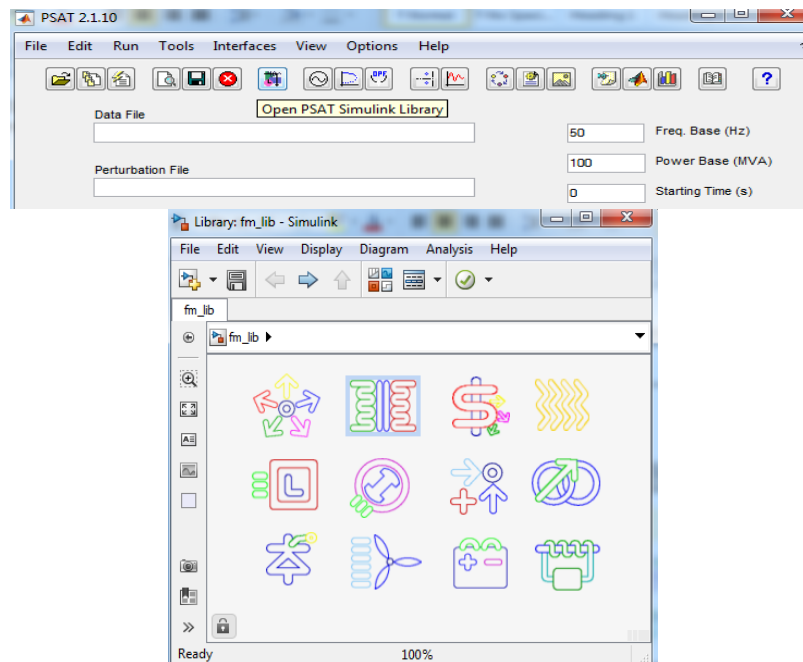
### Line Data:

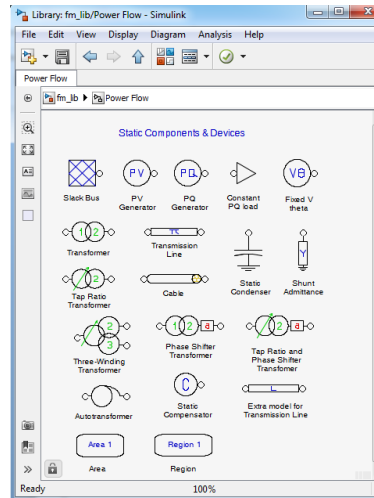
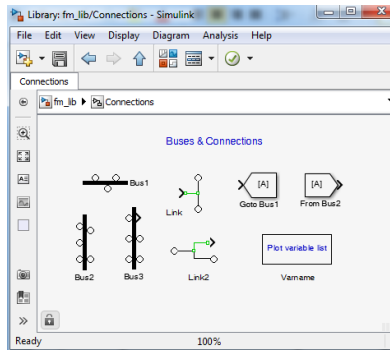
From Bus	To Bus	R(PU)	X(PU)	B(PU)
1	2	0.01008	0.0504	0.1025
1	3	0.00744	0.0342	0.0775
2	4	0.00744	0.0342	0.0775
3	4	0.01272	0.0636	0.1275

After you finish drawing your one-line diagram, you must save the file and load it to PSAT via the “Data File” field in the PSAT Main GUI. This will translate your Simulink diagram to a PSAT readable data file.

### Using the Power Flow Components:

Click on the Simulink icon of the PSAT Main GUI. The Simulink model library will appear. You only need to use two of the sub libraries.





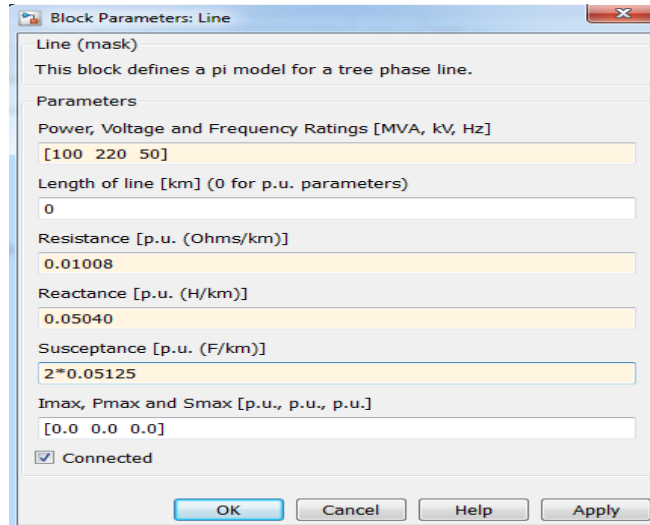
Drag and drop the components you need to use in a blank Simulink file.

Drag and drop the transmission model to a blank Simulink File. Double click on the component and introduce all the data.

**Line data:**

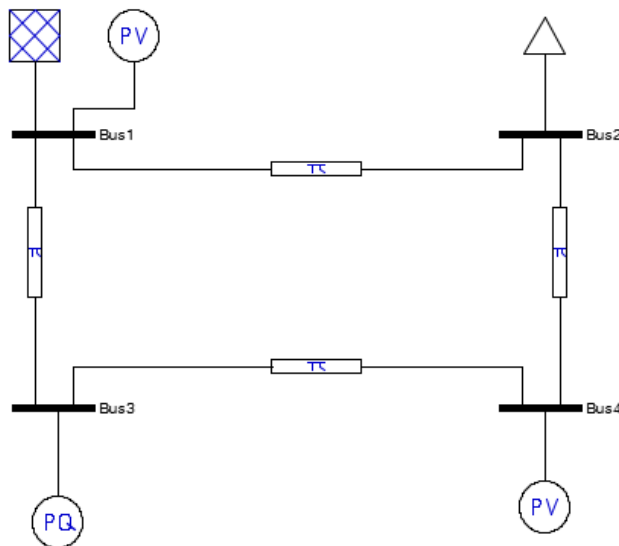
From Bus to Bus	R	X	S
1-2	0.01008	0.05040	2*0.05125





### Final One-Diagram:

Keep adding each of the remaining elements of the one-line diagram. If you have doubts on what to enter for each field of any element, you should first refer to the manual. If you don't have data for any specific field, use standard values. The final result looks similar to the one shown below.



### Remarks on Per Unit Values in PSAT:

The default power base is 100 MVA. This value can be changed in the main PSAT window.

- Buses define the voltage base in kV.
- Per unit values of each device are defined based on the power and voltage nominal rates of the device.
- Before running the power flow analysis the per unit value of each devices are converted to the system power base and to the voltage base of the bus at which the device is connected.

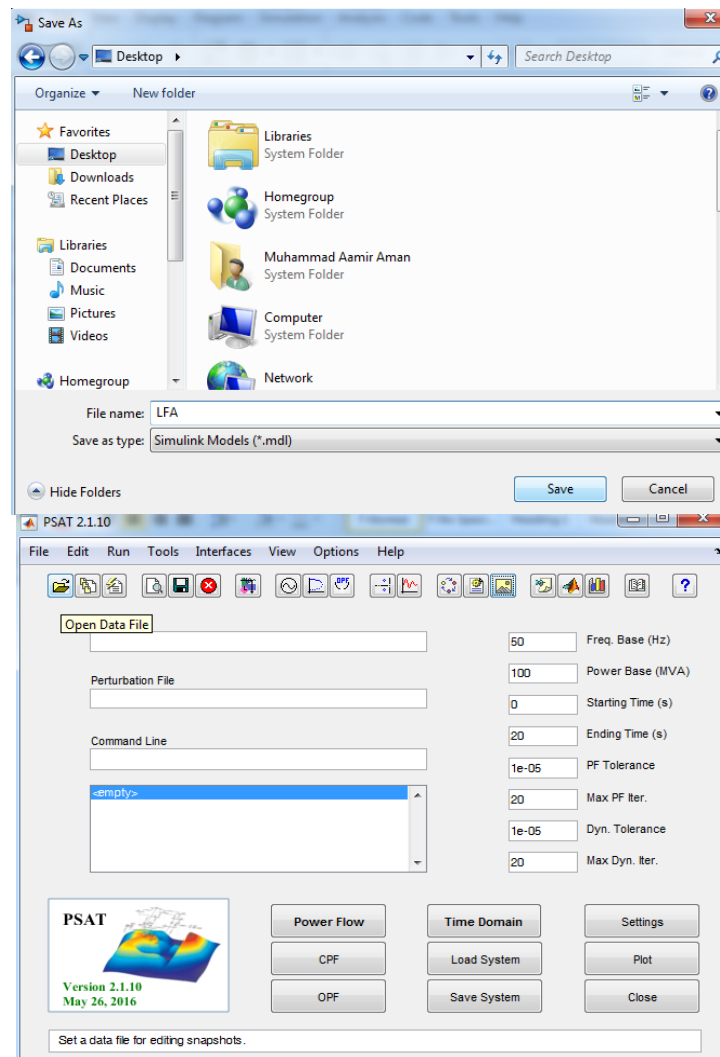
### Very Important Remarks:

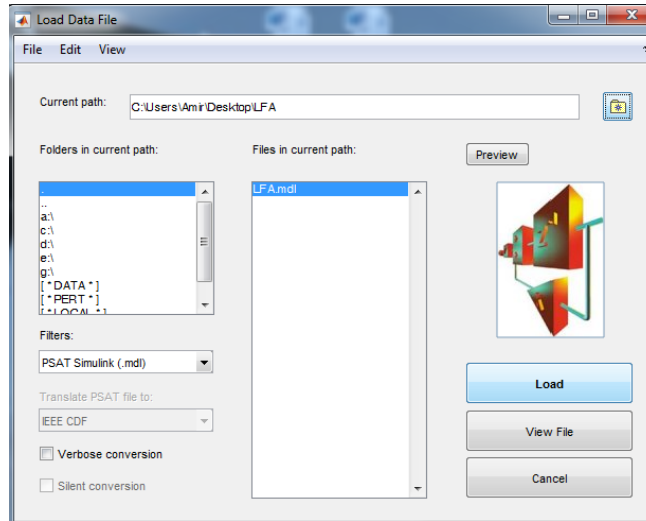
Power bases always refer to three phase apparent powers and are expressed in MVA.

- Voltage bases always refer to line-to-line values and are expressed in kV.
- Impedance and admittance values are always per phase.

### Load the model to PSAT:

Save the Simulink model, after saving the model load it to PSAT via the “Data File” field of the MATLAB.

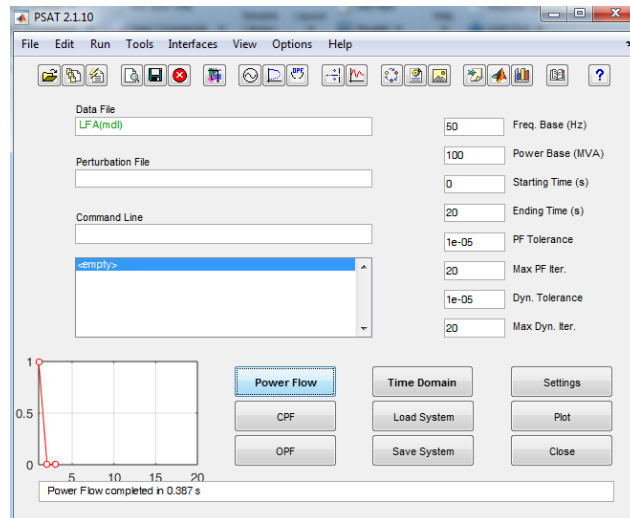




## Running Power Flow:

Remember to adjust the settings to what you desire (Frequency is 50 Hz in the Pakistan)

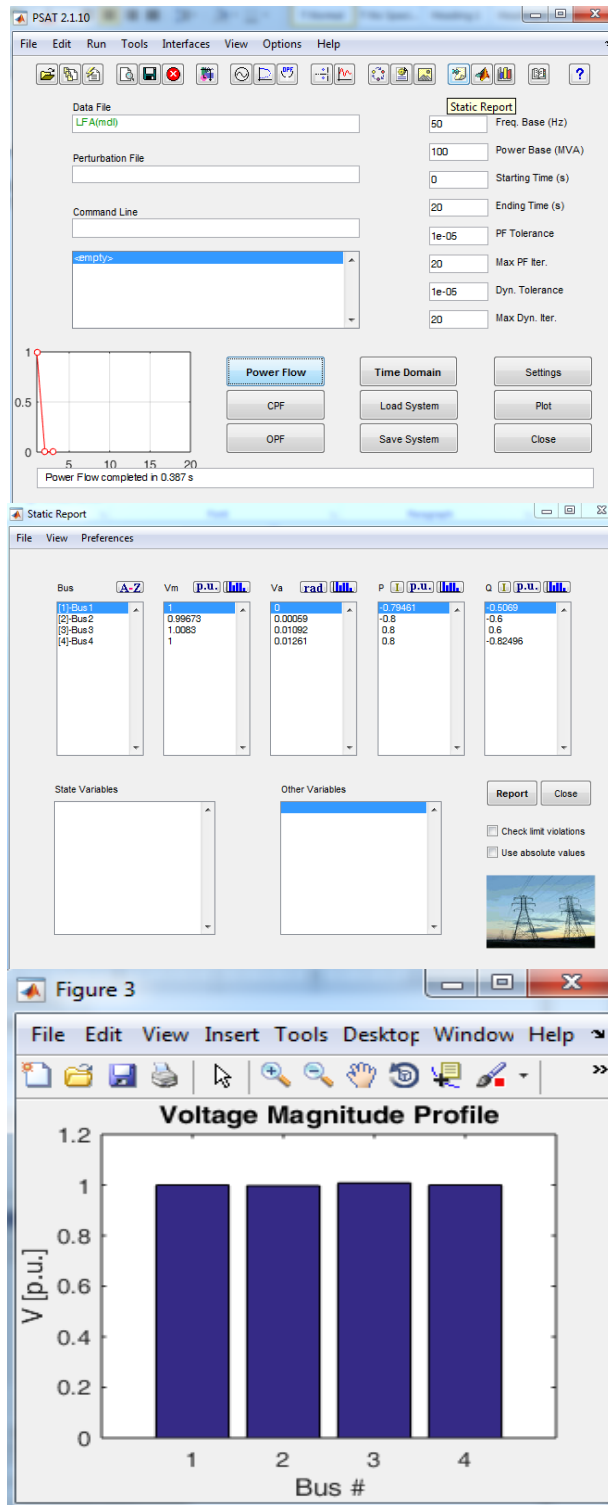
- Click on the “Power Flow” icon.
- A small window in the Main GUI will show you the iteration process; you will know when the program has converged to a solution.



## Viewing the Power Flow Results:

Click on the “Static Report” icon.

- The “Static Report GUI” will appear in your screen.



### Generating a power flow Report:

To generate a power flow report, click on the “Report” icon on the “Static Report” GUI.

- A text file will appear in your screen with the solution details.
- You can also set your preferences, such as Text Viewer in the “Preferences Menu”.
- You can also check limit violations and include shunts through the options below the “Report” button.

