Creating a file in PSCAD/EMTDC vers 4.2

- Create new project
- Set project as active (blue icon)
- Double click on project to open schematic drawing pallet
  » Can view an inactive project by not run it

Adding components (1)

- A few basic components in bars on right of screen

Adding components (2)

- Can also add components by right clicking mouse in drawing area
  » Add Component

Adding Components (3) Master Library

- Libraries for different types of components
  » Select one to expand it
  » Copy the component you want to use
  » Need to double click on your project
  » Paste the component
Moving Up Modules

When you are in a submodule you can move up with:

- Right click in drawing area
- Select “Project Settings”

Setting up your simulation

- Right click in drawing area
- Select “Project Settings”

Adding a Single Phase Source

- Copy source from library
- Double-click for dialog box
- Several pulldown menus
- First configuration

Usually interested in “Runtime”

- Duration
- Channel plot step
- May want to save channel to disk

Project Settings

- Duration
- Solution time step
- Channel plot step
- May want to save channel to disk
Source Configuration

- Enter source name
- Source impedance
  - For example ideal
    - Circuit symbol changes when done
- Can also specify
  - Grounding
  - AC/DC
  - Input internal or external
    - External allows user interactive or control loop

Other data entry points

- Signal parameters
  - RMS magnitude
  - Ramp-up time
    - Remember no steady-state solution
  - Initial phase (sine wave)
  - Frequency
- Impedance fields won’t allow entry for ideal

Resistors, Capacitors, Inductors

- For single phase branches can get from menus in window or master library
  - Need to get from master library for polyphase
  - Have option of 3 phase view of single line diagram view in later versions of program
- Enter R in ohms, L in H and C in µF

Switches and Faults

- Copy from Master Library
- For example, for a fault
  - Need the fault “switch” itself
  - And the fault timing control
  - And need a signal node
  - Signal name matches input name for fault (default is “Fault”)
- Similar for a breaker
  - Need three parts
Faults

- Configuration:
  - Fault name (control input)
    - Must match signal_name
  - Clearing and chopping are for switches
- Main data
  - On and Off resistance (same for switches—open close)

Internal Output

- Can request current output (can reduce node count)

Signal name:

- Set to match fault control input

Fault Timed Logic

- Set start time and duration of fault
- Attach signal name to end of line on icon:
  - Set to match fault control input

Breakers

- Configuration
  - Breaker name is again control input
- Can specify interrupting current
  - Current chopping limit
- Preinsertion resistance
  - Current limiting R
- Symbol type
Breakers

- Main Data
  - Open/Closed
  - Resistance
- Preinsertion

Output data
- Current measure
  - Name appears on circuit symbol

Connecting circuit together
- Wire icon on top toolbar
  - Pencil symbol appears
  - Trace with left mouse clicks
    - Click each time change direction
  - Right click or escape to complete
    - Right click lets you select points to rescale
- “Junction” to connect wires as cross each other (otherwise disconnected)
  - Get from right click in drawing space
Voltage and Current measurements

- Voltage measurements
  » Can do line to ground and arbitrary
    - Need to connect to circuit
    - Name the measurement (default is $E_a$)
- Current measurement
  » Need to connect to the line, don’t copy on top of a wire.

Output Channels

- Create output channel next
  » Again need signal
  » Connect to “Output channel”
- Choose Input/Output Reference

Input/Output Reference

- Several Options
  » Add Overlay Graph Most Common
  » If choose “Add as Curve”
  » Paste to existing graph
    - Right click in white part

Input/Output Reference: Meters

- Add as Meter
- Then select put a control panel in your drawing (from right side tool bars or right click of mouse)
  » Right click - Paste
Complete Circuit

**Without graphs shown**

**Coupled RL: EMTDC**
- Choose Mutually coupled wires from Master Library

**Distributed Parameter Line: EMTDC: Steps 1 and 2**
- Two interface options:
  - Step 1: Connect Interface Component into Circuit:
  - Step 2: Then copy in TLINE configuration component
    - Can be connected to interface components or
    - Directly connected
Distributed Parameter Line: EMTDC: Steps 3 and 4

- Step 3: Next choose Edit:
- Step 4: Copy Line Model and Options Box from Master Library:
  » In this case choose Bergeron (others later)

Distributed Parameter Line: EMTDC: Steps 5

- Step 5: Choose manual entry of X,Z
  
  Manual Entry of Y,Z
  
  » +ve Sequence R: 688.1e-7 [pu/m]
  » +ve Sequence XL: 7116e-8 [pu/m]
  » +ve Sequence XC: 951e-6 [pu/m]
  » 0 Sequence R: 251e-5 [pu/m]
  » 0 Sequence XL: 7116e-8 [pu/m]
  » 0 Sequence XC: 793e6 [pu/m]

Two interface options:
  » Step 1: Connect Interface Component into Circuit:
  » Step 2: Then copy in TLINE configuration component
    - Can be connect to interface components or
    - Directly connected

Distributed Parameter Line: EMTDC: Steps 5-cont.

Distributed Parameter Line: EMTDC: Steps 1, 2 stay same
Distributed Parameter Line:
EMTDC: Steps 3,4—stay same

- Step 3: Next choose Edit:
- Step 4: Copy Line Model and Options Box from Master Library:
  » In this case choose Bergeron (others later)

Step 5 changes:
- Now select Ground Component and Required Tower Components
  » Ground component:
    - Ground Resistivity: 100.0 [ohm*m]
    - Relative Ground Permeability: 1.0
    - Earth Return Formula: Analytical Approximation

Step 5 changes:
- Copy tower components from master library.
### Tower Data

**Universal Tower Geometry**

- Alternate option:

<table>
<thead>
<tr>
<th>Cond. #</th>
<th>Connection Phasing #</th>
<th>X (from tower centre) [m]</th>
<th>Y (at tower) [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>-5</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

**Ground_Wires:** 1/2" HighStrengthSteel

### Conductor Data

**Universal Tower Geometry**

<table>
<thead>
<tr>
<th>Conductor Name</th>
<th>Phasing</th>
<th>DC Resistance [mΩ]</th>
<th>SAG for all Conductors [m]</th>
</tr>
</thead>
<tbody>
<tr>
<td>chukar</td>
<td></td>
<td></td>
<td>0.1200 [mΩ]</td>
</tr>
</tbody>
</table>

**Universal Tower Geometry**
Conductor Coordinates

- Transformer Models
  - Main dialog box
    - Note per unit leakage reactance
    - No load losses are from open circuit test
    - Copper losses are from rated current through the winding resistances as above
    - Note that ideal transformer not selected.

Saturation was not enabled. So the only line that means anything here is the magnetizing current.

- Note that unless the transformer is specified as ideal the magnetizing current cannot be set to zero.
Autotransformer