

Introduction to ATPDraw version 5

- Introduction to ATPDraw
- Multi-phase circuits
- Vector graphics
- Grouping
- Hybrid transformer
- Machines
- Models
- Lines&Cables

Introduction

- ATPDraw is a graphical, mouse-driven, dynamic preprocessor to ATP on the Windows platform
- Handles node names and creates the ATP input file based on "what you see is what you get"
- Freeware
- Supports
 - All types of editing operations
 - ~100 standard components
 - ~40 TACS components
 - MODELS
 - \$INCLUDE and User Specified Components

Introduction- ATPDraw history

- Simple DOS version
 - Leuven EMTP Centre, fall meeting 1991, 1992
- Extended DOS versions, 1994-95
- Windows version 1.0, July 1997
 - Line/Cable modelling program ATP_LCC
 - User Manual
- Windows version 2.0, Sept. 1999
 - MODELS, more components (UM, SatTrafo ++)
 - Integrated line/cable support (Line Constants + Cable Parameters)



BPA
Sponsored

Introduction- ATPDraw history

- Windows version 3, Dec. 2001
 - Grouping/Compress
 - Data Variables, \$Parameter + PCVP
 - LCC Verify + Cable Constants
 - BCTRAN
 - User Manual @ version 3.5
- Windows version 4, July 2004
 - Line Check
 - Hybrid Transformer model
 - Zigzag Saturable transformer
- Windows version 5, Sept. 2006
 - Vector graphics, multi-phase circuits, new file handling

Latest news, Version 5.0 available from October 2006

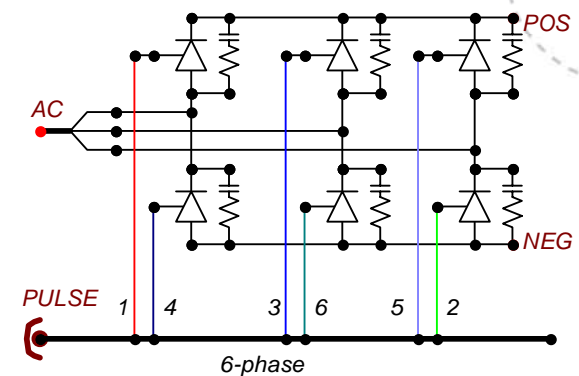
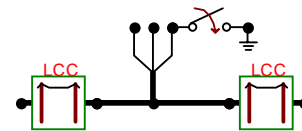
Sponsored by BPA & EEUG

- **Vector graphics**

- Improved zoom
- Larger, dynamic icon; RLC, transformer, switch...
- Individual selection area

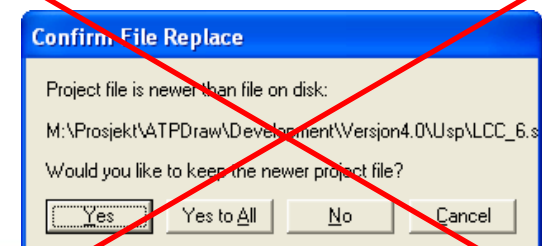
- **Multi-phase nodes**

- 1..26 phases, A..Z extension
- MODELS input/output X[1..26]
- Connection between n -phase and single phase
- 21 phases in LCC components



- **New file management**

- Project file follows the PKZIP 2 format. Improved compression. acp-extension.
- Sup-file only used when a component is created.
- External data moved from files to memory.
- Individual, editable help strings for all components.



ATPDraw main windows, v5.2

The screenshot displays the ATPDraw v5.2 software interface. The main window shows a circuit diagram with a lightning position and a 500 m long line. A smaller window titled 'Map' is visible. A component selection menu is open, showing options like 'Lumped', 'Distributed', and 'LCC'. The interface includes a main menu, a tool bar, and a component bar (optional). The circuit under construction is shown in the bottom window, featuring a 132 kV source, a 22.2 mH inductor, and various transformers and cables.

Main menu → File Edit View ATP Library Tools Window Help

Tool bar → [Icons for file operations and editing]

Component bar (optional) → [Icons for component selection]

Header, circuit file name → C:\ATP\ATPDraw\Project\Exa_15.acp

Circuit windows → C:\ATP\ATPDraw\Project\Exa_14.acp

Circuit under construction → Calculation of harmonics in HVDC 24 pulse power supply utilizing zigzag transformers with ± 7.5 deg. phase shift. A model FOURIER calculates up to 26th harmonics using a recursive DFT routine. The zigzag transformer implementation is documented in H. K. Høidalen, R. Sporild: "Using Zigzag Transformers with Phase-shift to reduce Harmonics in AC-DC Systems", IPST'05, Montreal-C

Component selection menu → Probes & 3-phase, Branch Linear, Branch Nonlinear, Lines/Cables (Lumped, Distributed, LCC), Switches, Sources, Machines, Transformers, MODELS, TACS, User Specified, Frequency comp., All standard comp...

Circuit map → Map

MODE: EDIT

ATPDraw Component dialog

The screenshot shows the 'Component: RLC3.SUP' dialog box. It features two main tables: one for component parameters (DATA, UNIT, VALUE) and one for node connections (NODE, PHASE, NAME). The dialog also includes fields for 'Order', 'Label', 'Comment', and 'Output', along with checkboxes for 'Hide', 'Lock', and '\$Vintage,1'. Annotations point to various features: 'Editable data values' points to the parameter table; 'Windows clipboard support' points to the 'Copy' and 'Paste' buttons; 'Branch output' points to the 'Output' dropdown; 'Edit local definitions: icon/help/pos/name/units' points to the 'Edit definitions' button; 'Node names' points to the 'NAME' column in the node table; 'Used for sorting' points to the 'Order' field; 'Label on screen' points to the 'Label' field; 'Comment in ATP file' points to the 'Comment' field; 'Component not to ATP' points to the '\$Vintage,1' checkbox; and 'High precision' points to the '\$Vintage,1' checkbox.

Editable data values

DATA	UNIT	VALUE
R_1	Ohms	1
L_1	mH	0.001
C_1	μF	0
R_2	Ohms	1
L_2	mH	0.001
C_2	μF	0
R_3	Ohms	1
L_3	mH	0.001

Node names

NODE	PHASE	NAME
IN1	ABC	SOUR
OUT1	ABC	LOAD

Used for sorting

Order: 0

Label on screen

Label: Soure imp.

Comment in ATP file

Comment: Impedance on the HV side

Component not to ATP

Hide
 Lock
 \$Vintage,1

High precision

\$Vintage,1

Windows clipboard support

Copy Paste entire data grid

Branch output

Output: 1 - Current

Edit local definitions: icon/help/pos/name/units

Edit definitions

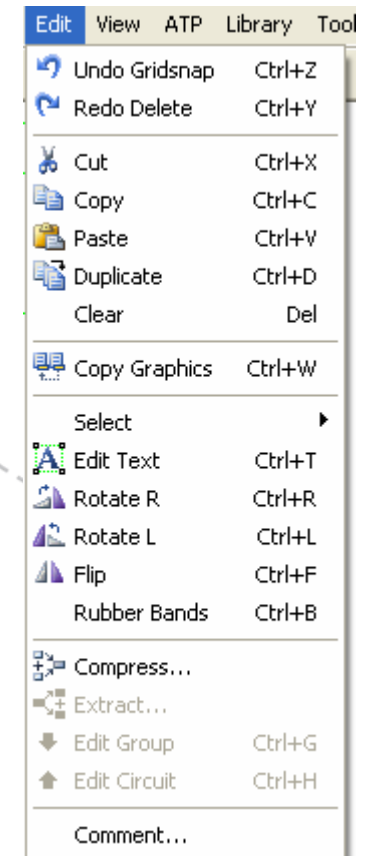
OK Cancel Help

ATPDraw capability

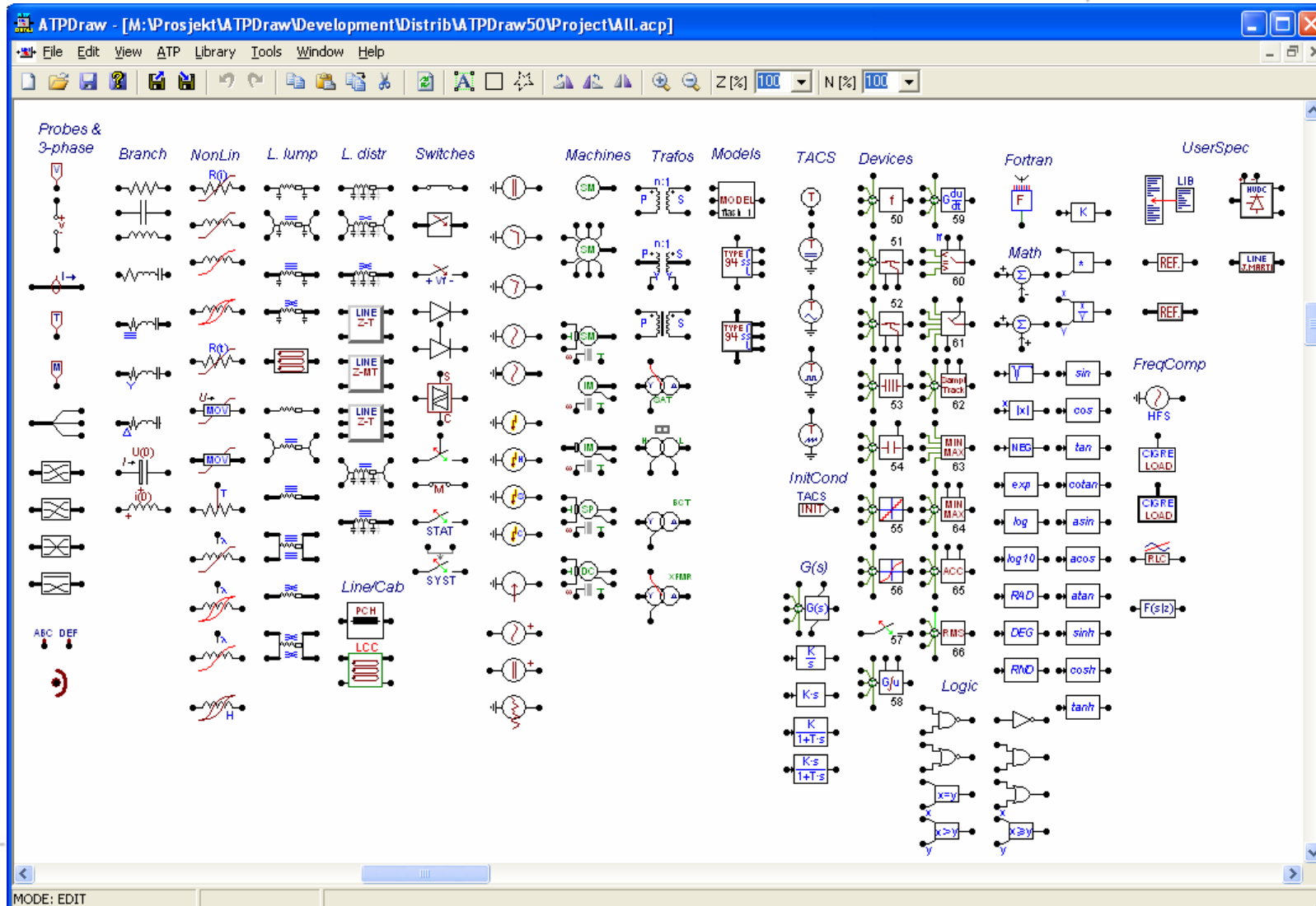
- 30.000 nodes
- 10.000 components
- 10.000 connections
- 1.000 text strings
- Up to 64 data and 32 nodes per component
- Up to 26 phases per node (A..Z extension)
- 21 phases in LCC module
- Circuit world is 10.000x10.000 pixels
- 100 UnDo/ReDo steps

ATPDraw Edit options

- Multiple documents
 - several circuit windows
 - large circuit windows (map+scroll)
 - grid snapping
- Circuit editing
 - Copy/Paste, Export/Import, Rotate/Flip,
 - Undo/Redo (100), Zoom, Compress/Extract
 - Windows Clipboard: Circuit drawings, icons, text, circuit data
- Text editor
 - Viewing and editing of ATP, LIS, model files, and help files
- Help file system
 - Help on ATPDraw functionality, all components, and MODELS

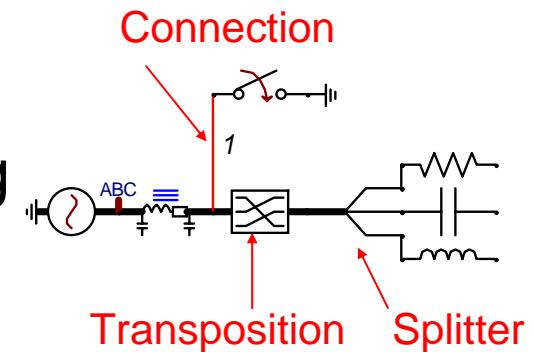
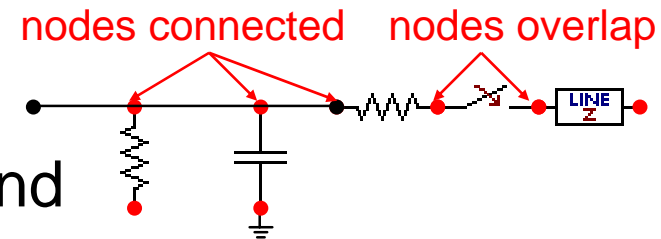


All standard components:



ATPDraw node naming

- "What you see is what you get"
- Connected nodes automatically get the same name
 - Direct node overlap
 - Positioned on connection
- Warnings in case of duplicates and disconnections
- 3-phase and n -phase nodes
 - Extensions A..Z added automatically
 - Objects for transposition and splitting
 - Connection between n - and single phase

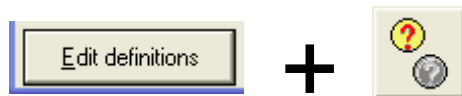


User's manual

- Documents version 3.5 of ATPDraw (246 pages), pdf
- Written by Laszlo Prikler and H. K. Høidalen
- Content
 - Intro: To ATP and ATPDraw + Installation
 - Introductory manual: Mouse+Edit, MyFirstCircuit
 - Reference manual: All menus and components
 - Advanced manual: Grouping/LCC/Models/BCTTRAN + create new components
 - Application manual: 9 real examples

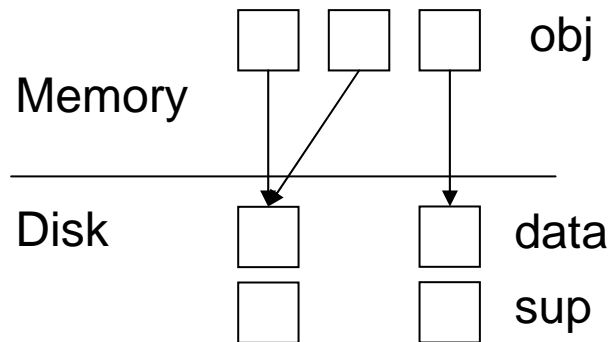
Files in ATPDraw

- Project file (acp): Contains all circuit data.
- Support file (sup): Component definitions. Used only when a component is added to the project.
 - Standard components: ATPDraw.scl
 - User defined components: Optionally in global library
- Data file (alc/bct/xfm): Contain special data
 - Stored internally in data structure
 - Optionally in global library
- Help file (sup/txt): User specified help text
 - Global help stored in sup-file or /HLP directory (txt file)
 - Local help created under *Edit definitions*



Data files in memory

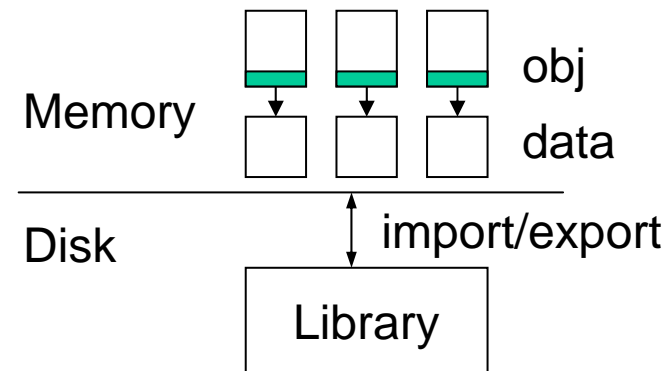
Old:



Problems:

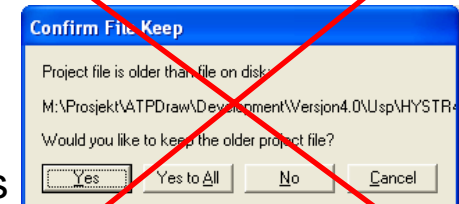
- Where? Lots of files/messy disk
- Conflicts between projects

New:



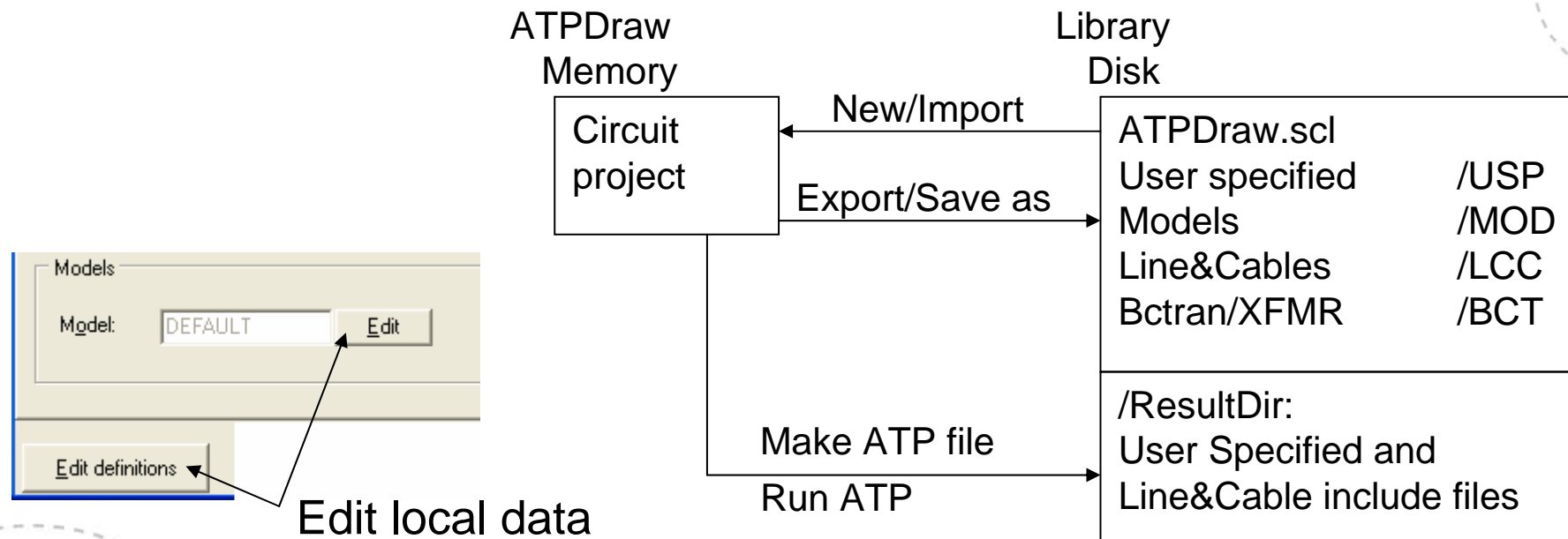
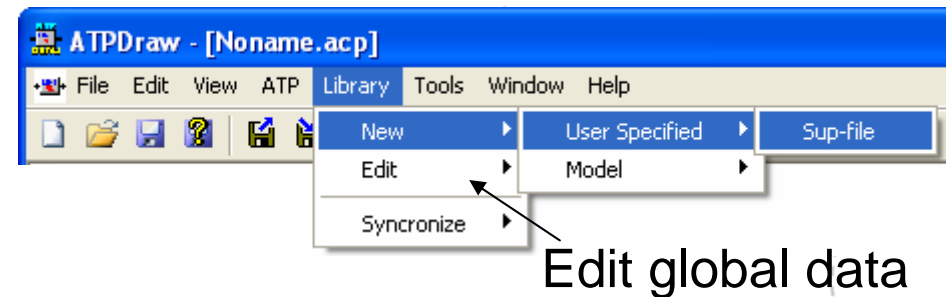
Solutions:

- No files extracted to disk
- Import/Export allowed
- Clear distinction between global library and projects
- No conflicts between projects



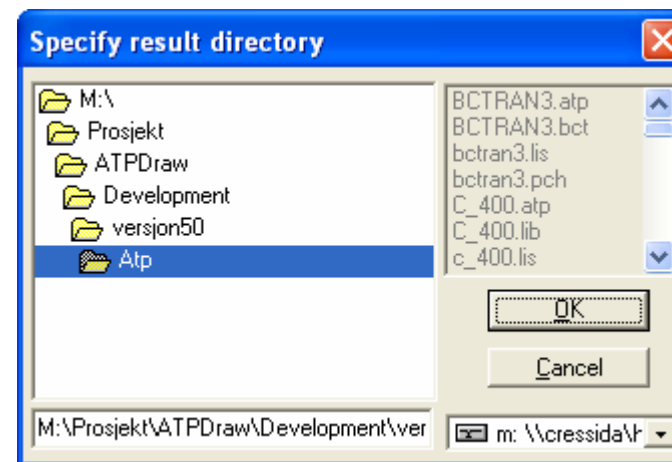
Project vs. Library: Local|Global

- When a new component is added to the project:
- All information copied into the project
- No links to files



Result Directory

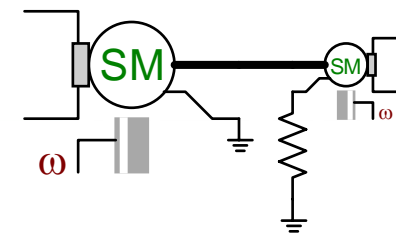
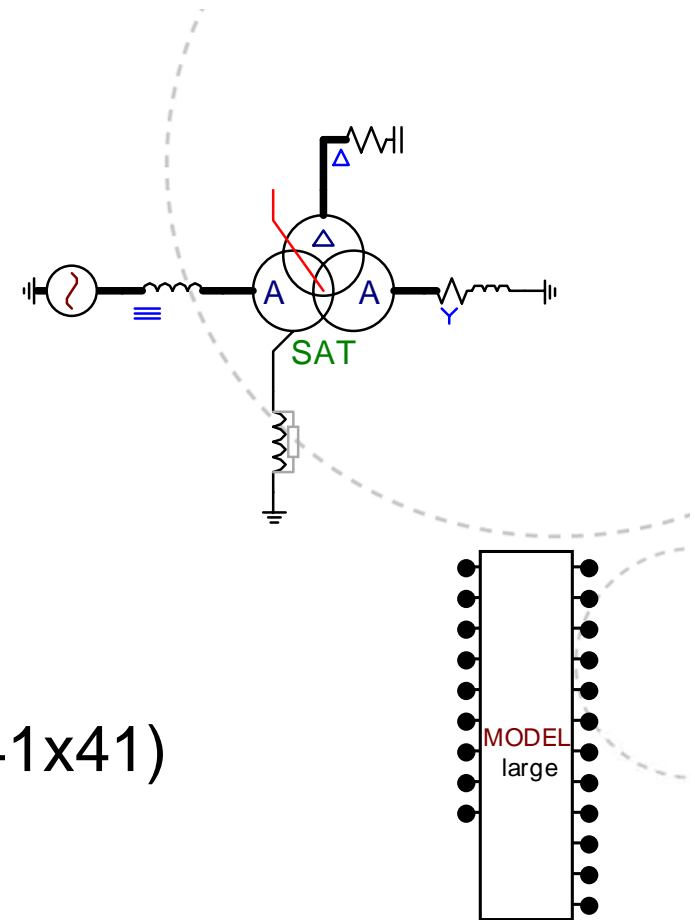
- The user initially specifies where the result should be stored (ATP and \$Include files)





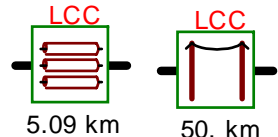
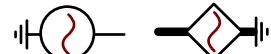
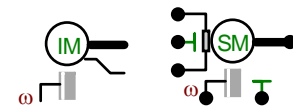
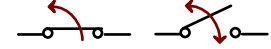
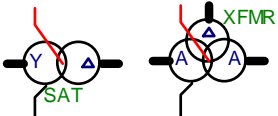
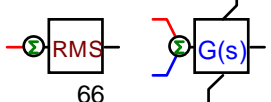
- ATPDraw.ini in APPDATA/ATPDraw

Vector graphics

- Sponsored by EEUG (2007)
- Better zooming and dynamics
- Increased icon size 255x255 (from 41x41)
- Allow more nodes than 12
- Additional: Flipping & Individual scalable icons



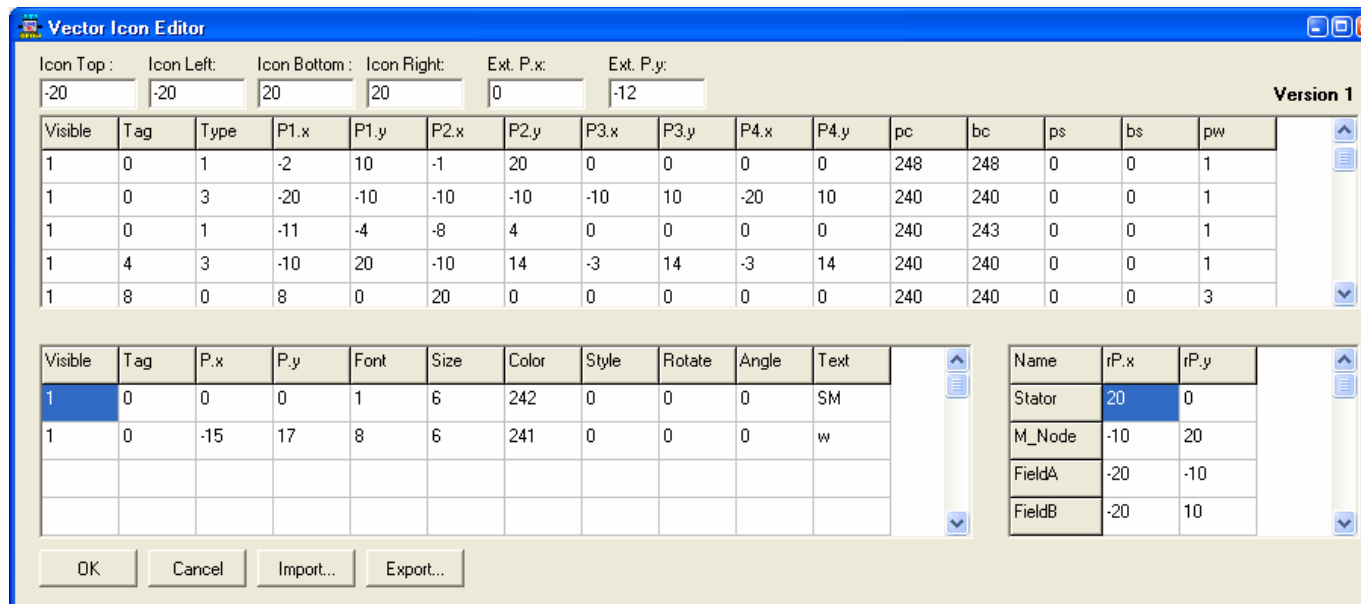
Dynamic icons

RLC, RLC3, RLCD3, RLCY3; R, L, C, RL, RC, LC, RLC appearance.	
PROBE_I (Current probe); Single phase or three phase appearance.	
LCC; Overhead line, single core cable, or enclosing pipe appearance. Length of transmission line optionally added.	
All sources; current (rhomb) or voltage (circle) source appearance.	
Universal machines; manual/automatic initialization, neutral grounding.	
TSWITCH (Time controlled switch); opening/closing indications.	
Transformers; Coupling (Wye, delta, auto, zigzag), two/three windings.	
TACS summation. Positive (red), negative (blue), or disconnected input. Click on the nodes to activate.	

Vector icon editor

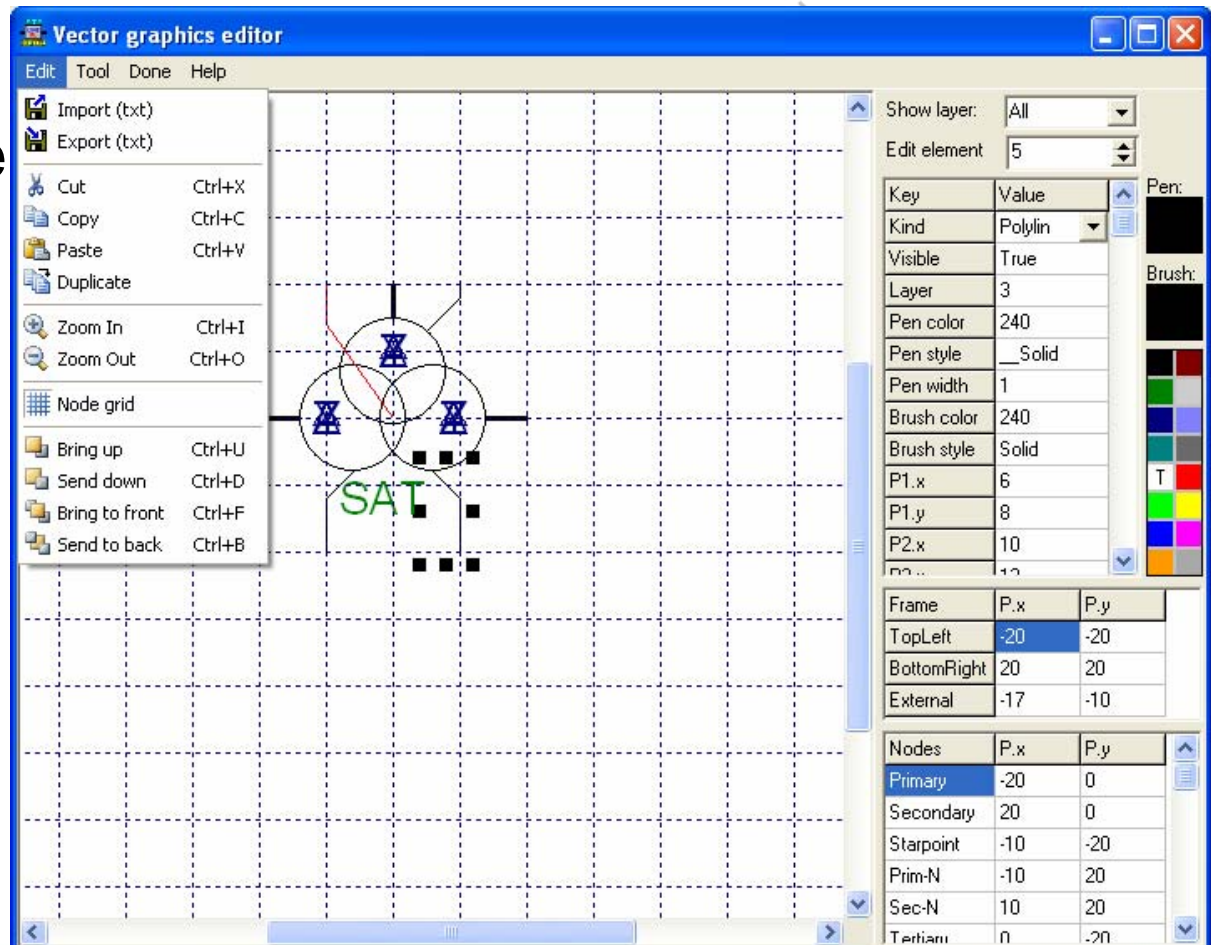
- Difficult for the user to change the default icons
 - Vector elements
 - Node positions
- Vector editor is text based.
 - Shapes and Texts

Shapes:



New vector editor (v.5.2)

- Still text based
- No mouse response
- Visual response
- Color support
- Element ordering



Multi-phase circuits

- EEUG sponsored project
- Why?
 - Problems and bugs related to the Splitter
 - Better support of MODELS input/output arrays
 - Need for multi-phase communication in Groups and Models

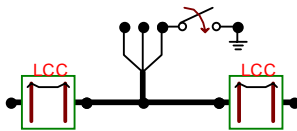
Principles

- Nodes and connections extended to 26-phase (A..Z node name extension)
- Only 3-phase nodes transposed
- Model arrays $X[1..26]$ supported
- Special connection between single phase and n -phase node
- Connection properties: Color, label, phase carried
- Extended Probe capabilities
- LCC module capability increased to 21 phases

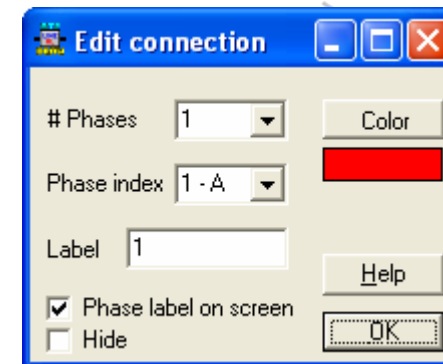
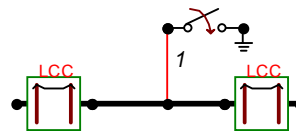
Example 1

- Single phase to 3-phase connection

Old:



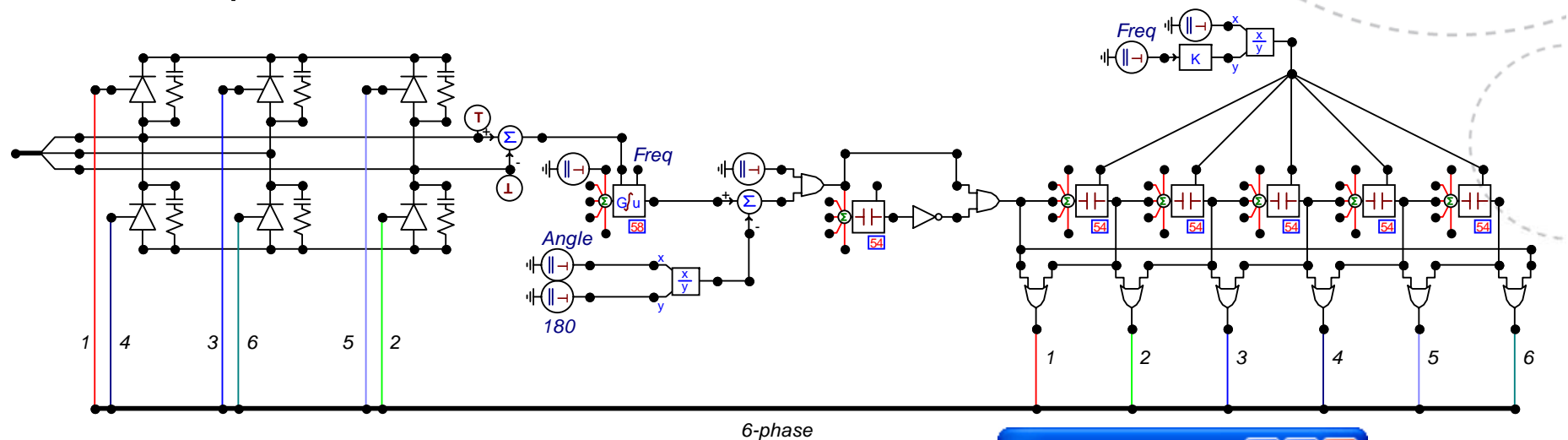
New:



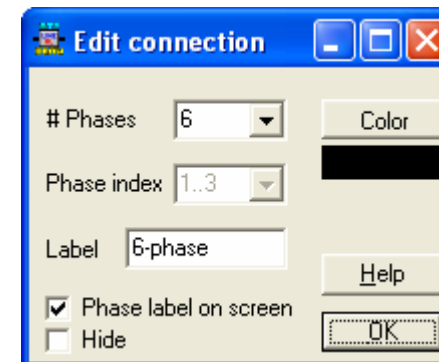
- The Splitter carries Transpositions the single phase connection not.

Example 2

- Multi-phase connections

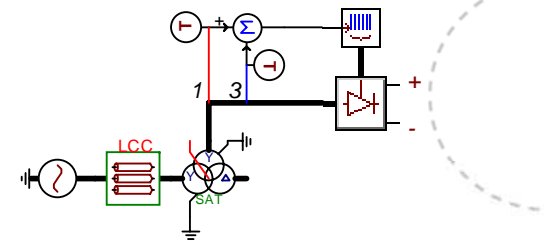
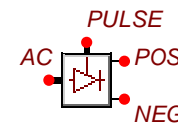
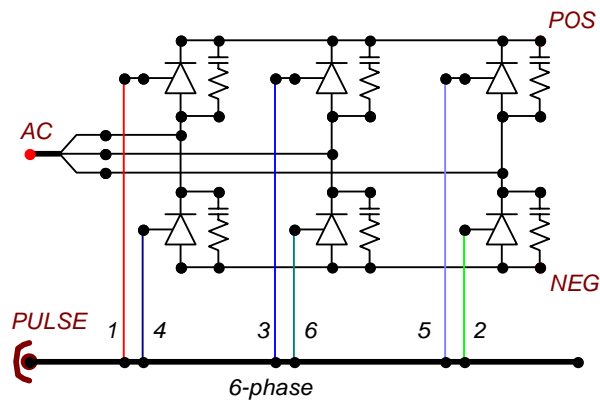


- Increased circuit readability



Example 3

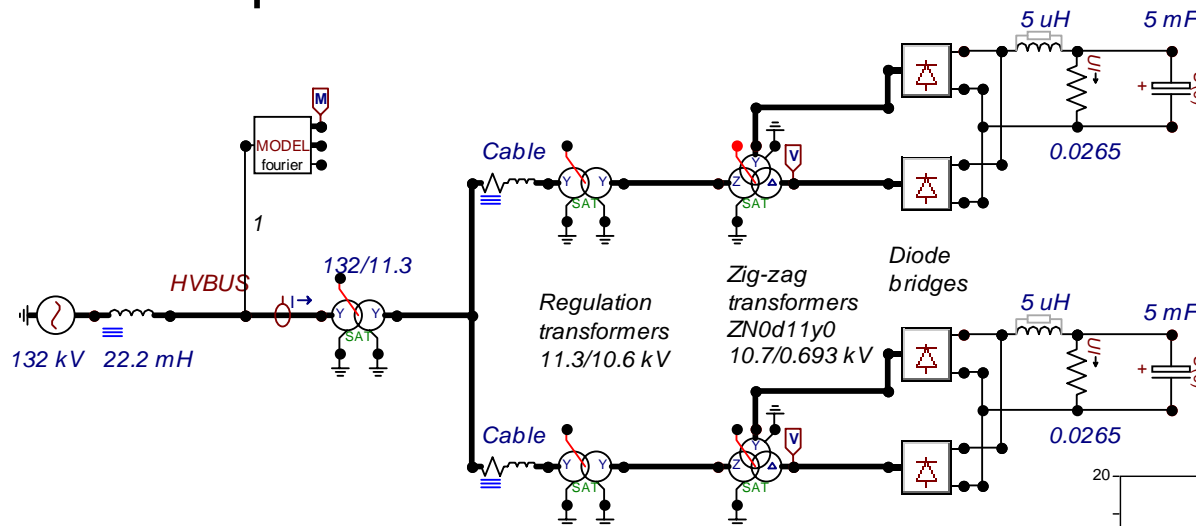
- Multi-phase groups



- New component: Collector

Example 4

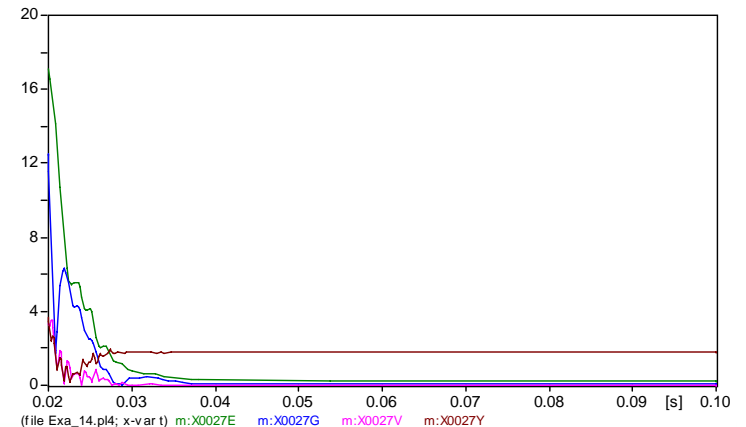
- Multi-phase Models



- New Model probe

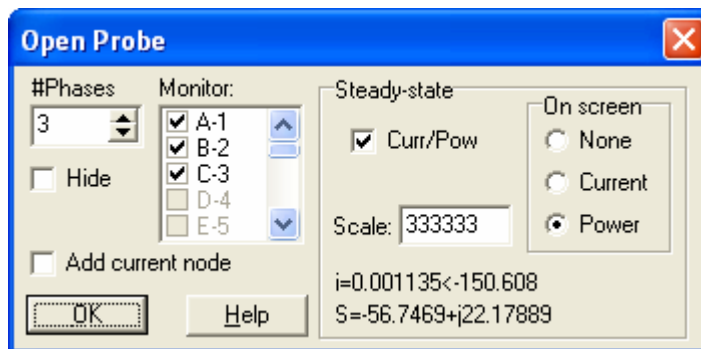
```
MODEL FOURIER
INPUT X          --input signal to be transformed
DATA FREQ {DFLT:50} --power frequency
    n {DFLT:26}  --number of harmonics to calculate
```

```
OUTPUT absF[1..26], angF[1..26], F0  --DFT signals
VAR    absF[1..26], angF[1..26], F0, reF[1..26], imF[1..26],
    i, NSAMPL, OMEGA, D, F1, F2, F3, F4
```



Example 5

- Extended Probe capabilities
 - Monitor 1-26 phases
 - Read and display steady-state values

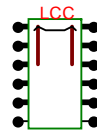


$-56.7+j22.18$



Example 6

- Increased LCC capability
- 16-phase overhead line:



Line/Cable Data:

Model | Data

System type
Overhead Line #Ph: 16

Transposed
 Auto bundling
 Skin effect
 Segmented ground
 Real transf. matrix

Units
 Metric
 English

Standard data
Rho [ohm*m] 100
Freq. init [Hz] 50
Length [km] 123

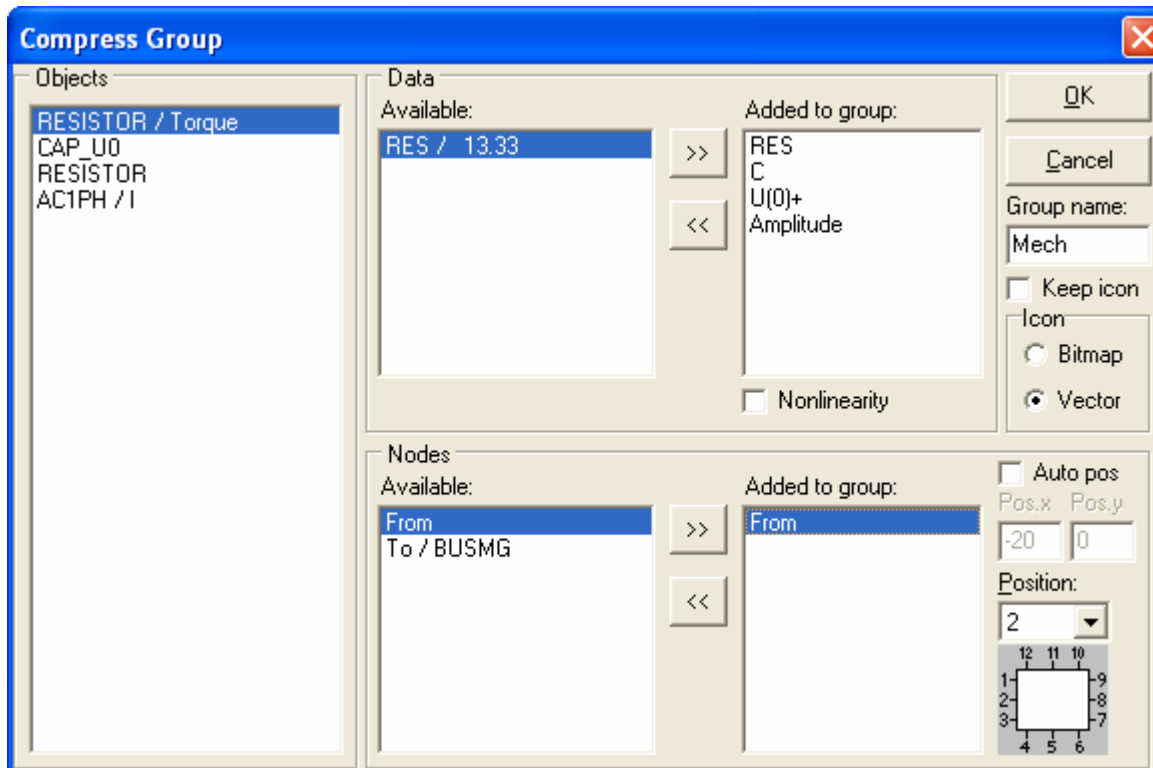
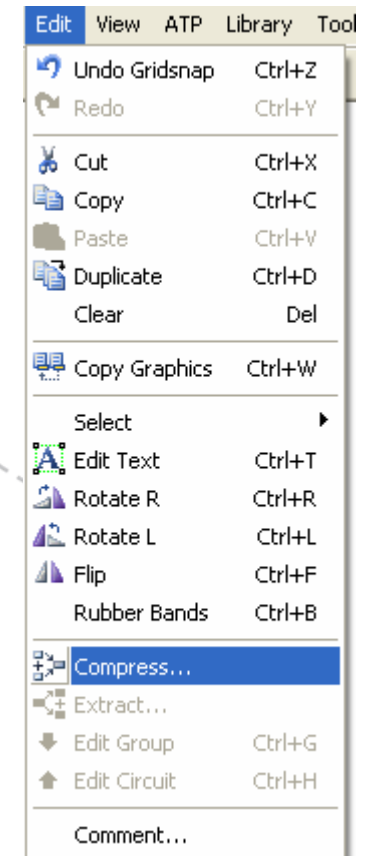
Model
Type
 Bergeron
 PI
 JMarti
 Semlyen
 Noda

Comment: Order: 0 Label: Hide

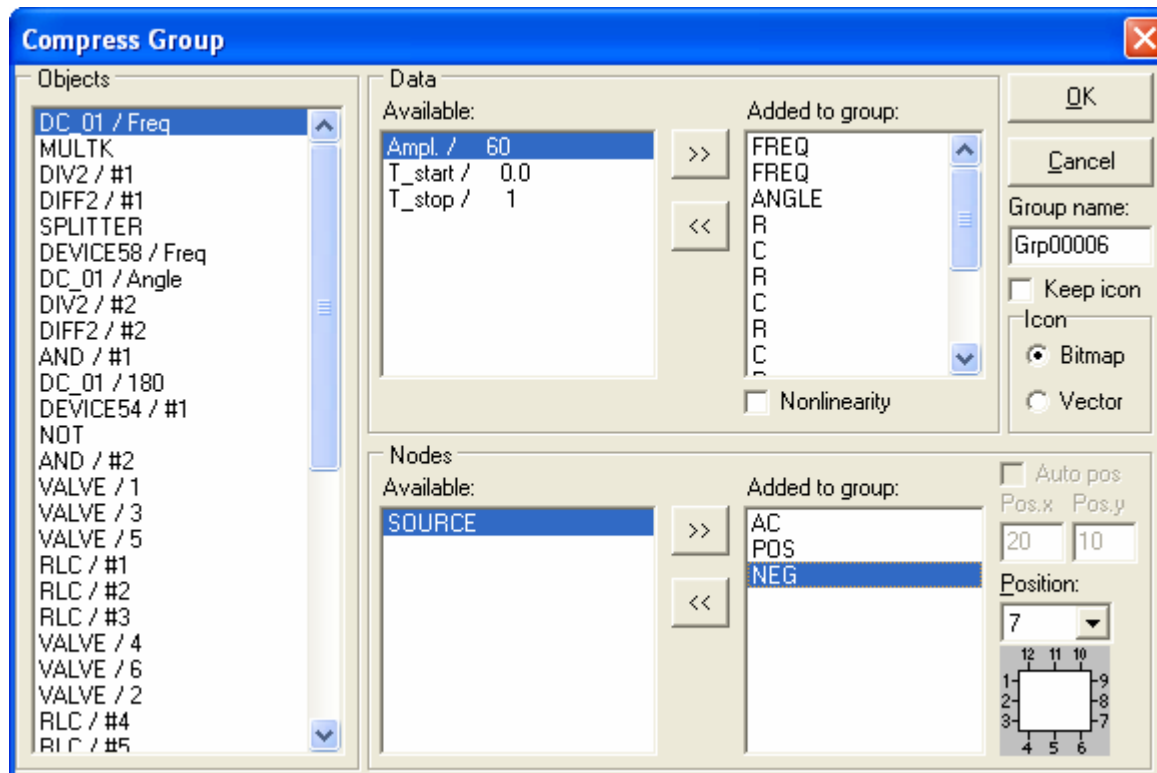
OK Cancel Import Export Run ATP View Verify Edit icon Help

Grouping

- Select a group (components, connections, text)
- Click on Edit|Compress
- Select external data/nodes



Compress dialog



Note:

Group name: just for icon

Keep icon: in case of recompress

Chose between
Bitmap/Vector

Vector supports automatic
node positioning

Old style 1-12 borderpos
kept

Specify Position=0 to
enable (x, y) pos.

Grouping - special

- Data with the same name appear only once in the input dialog

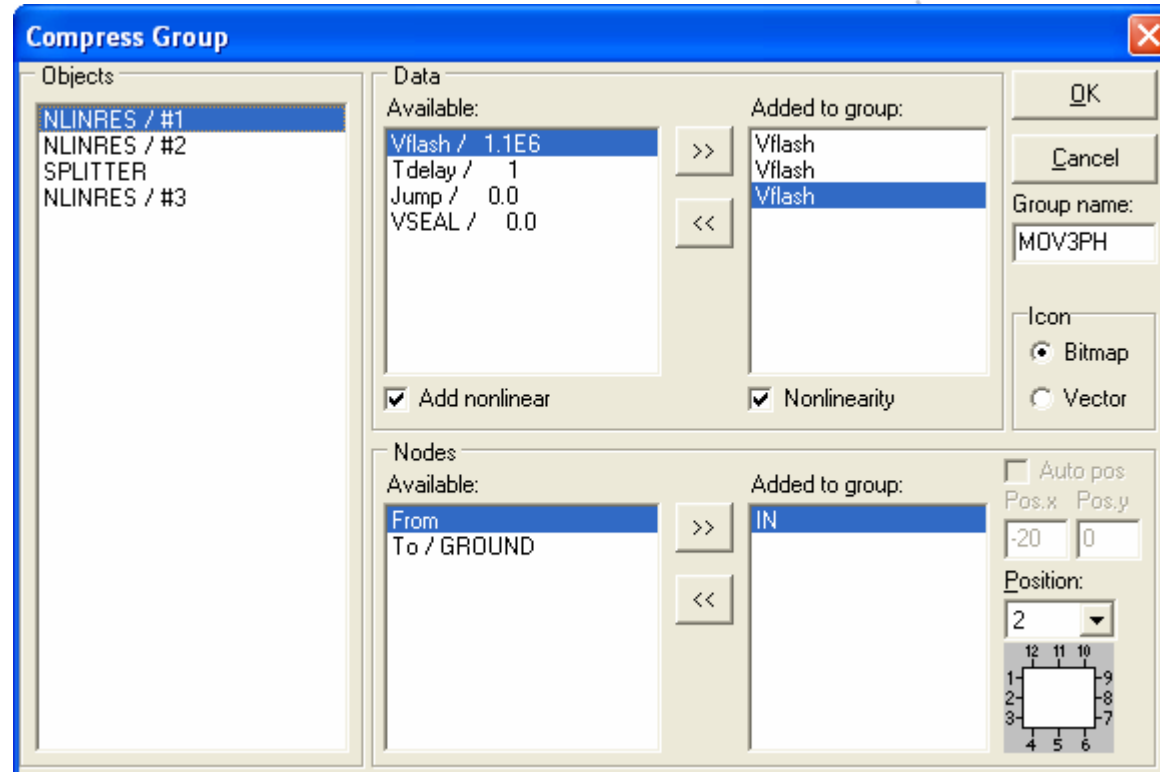
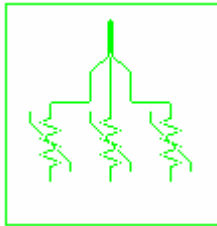
- Data value copied
- Double click on name to change

Added to group:
RES
C
U(0)+
Amplitude
RES

DATA	UNIT	VALUE
RES	Ohms	13.33
C	uF	5000000
U(0)+	Volts	182.840692
Amplitude	Volts/Amps	-374.03889

- Nonlinear characteristic supported

Example Create 3-phase MOV



A small schematic diagram of a MOV component, showing a rectangular box with a diagonal line and a capacitor symbol.

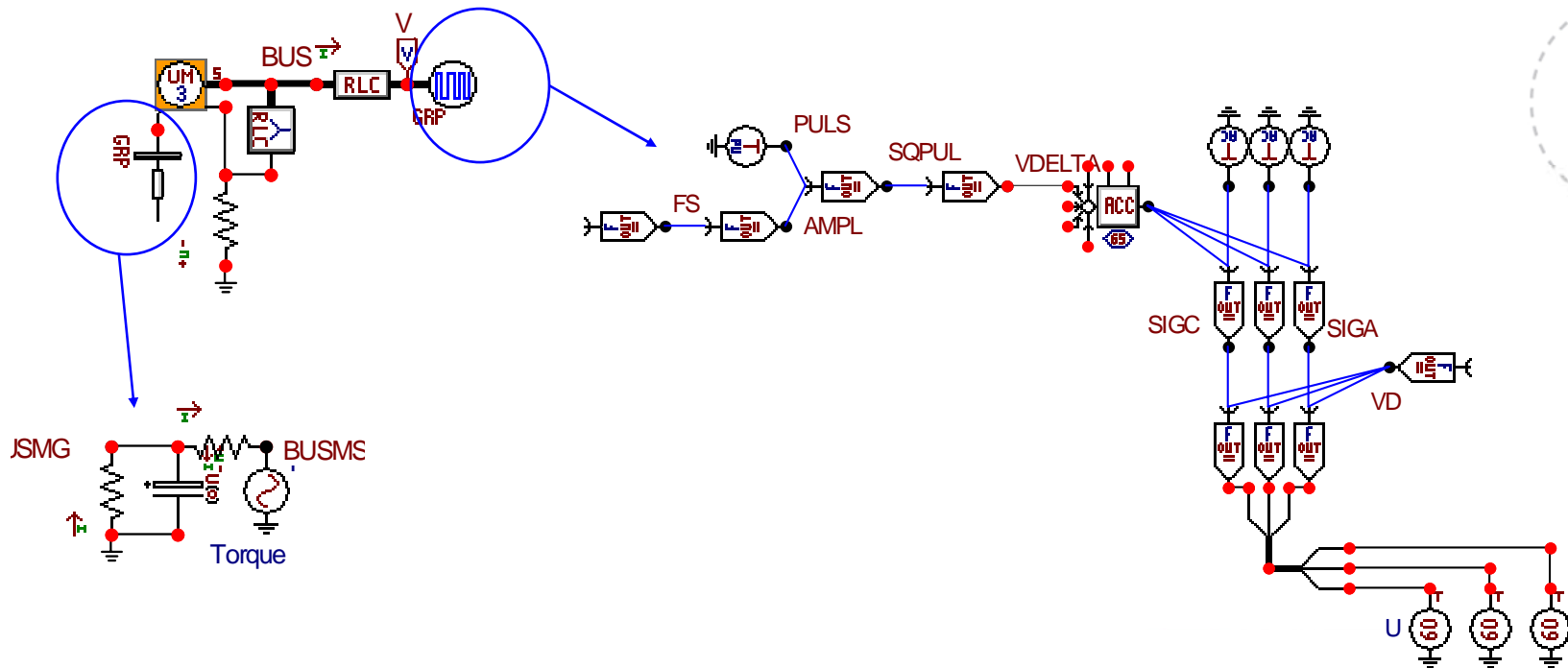
Group: MOV3PH

Attributes | Characteristic

DATA	UNIT	VALUE	NODE	PHASE	NAME
Vflash	Volts	1100000	IN	3	

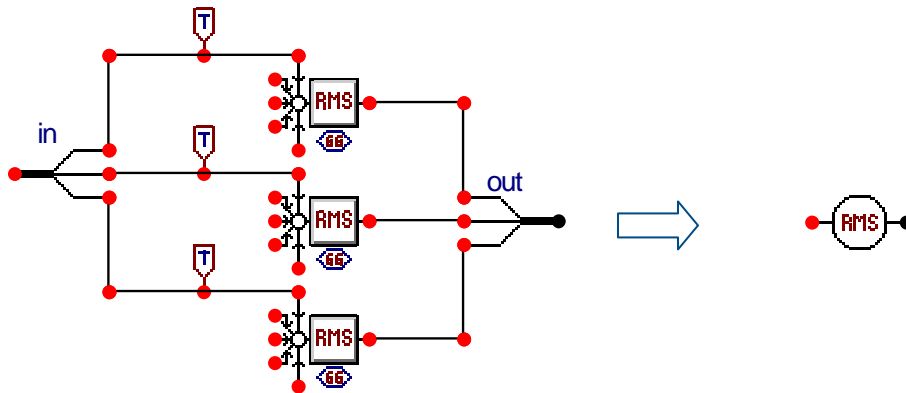
Example – Induction motor

- Induction motor fed by a pulse width modulated voltage source
- External mechanical load

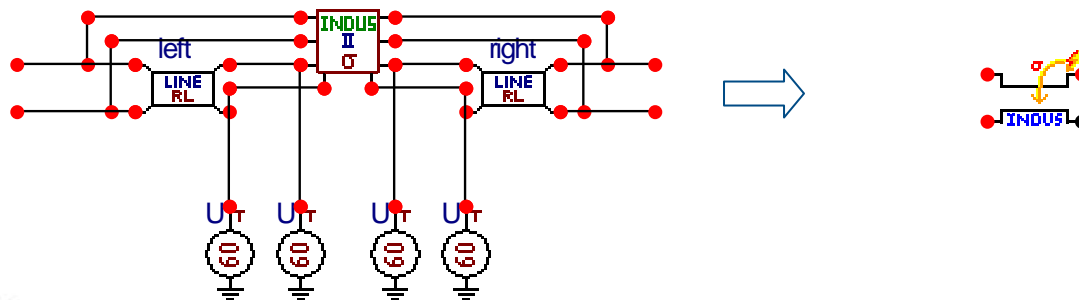


Examples

- 3-phase RMS-meter

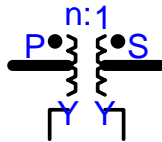
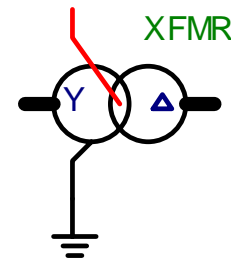
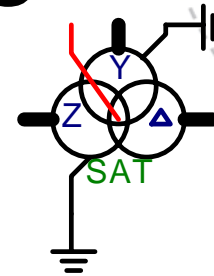
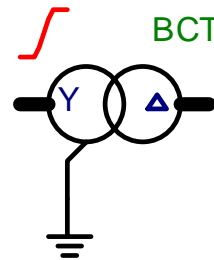


- Lightning-induced voltage in 2-phase overhead line



Transformer modeling

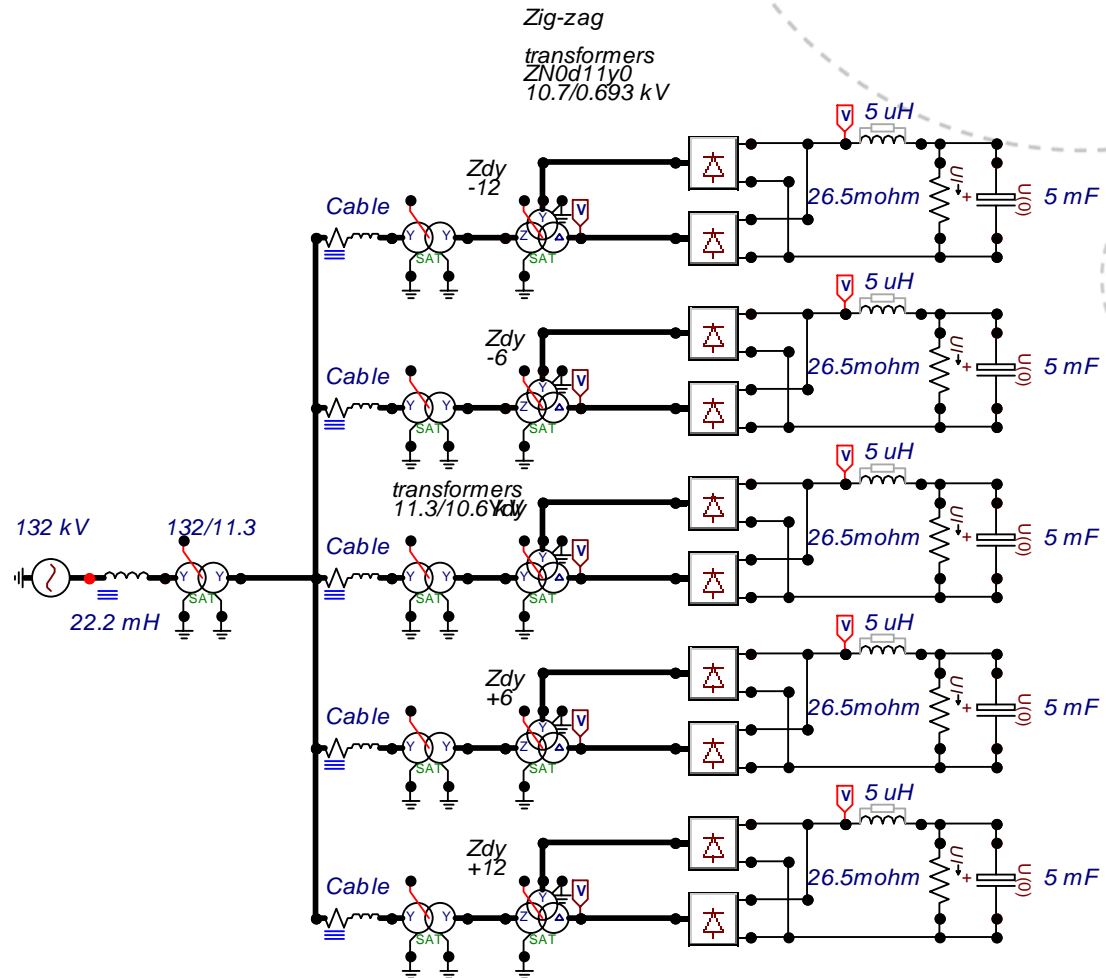
- Saturable Transformer
- BCTRAN
- Hybrid Transformer
- Ideal



Saturable transformer

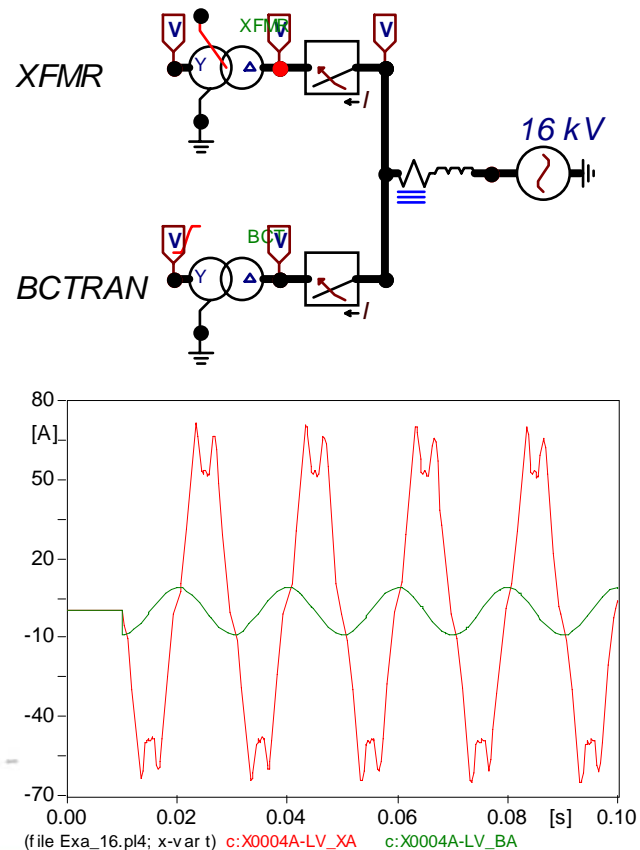
- Zigzag supported

	Prim.	Sec.	Tert.
U [V]	85.92	2.11	1.23
R [ohm]	-0.064193	0.00019	6.6E-5
L [mH,ohm]	1.2260045	0.00973	0.00331
Coupling	Z	D	Y
Phase shift	-12	330	0
I(0)=	0	Rm=	0
F(0)=	0	R0=	1E12
		<input checked="" type="checkbox"/>	3-leg core
		<input type="checkbox"/>	RMS
		<input checked="" type="checkbox"/>	3-winding



BCTRAN

- Automatic inclusion of external magnetization characteristic



BCTRAN: M:\Prosjekt\ATPDraw\Development\versjon50\atp\BCTRAN.pch

Structure

Number of phases: 3
 Number of windings: 2
 Type of core: 3-legged stacked core
 Test frequency [Hz]: 50
 AR Output Auto-add nonlinearities

Ratings

	HV	LV
L-L voltage [kV]	432	16
Power [MVA]	290	290
Connections	Y	D
Phase shift [deg]		30
		<input type="checkbox"/> Ext. neutral connections

Factory tests

Open circuit | Short circuit

Performed at: LV Connect at: LV Zero sequence data available

positive sequence

Volt (%)	Curr (%)	Loss (kW)
75	0.05	83.094
87.5	0.11	118.818

Positive core magnetization

Linear internal External Lm External Lm || Rm

View/Copy: Rm Lm-rms Lm-flux

Order: 0 Label: Factory test data Hide

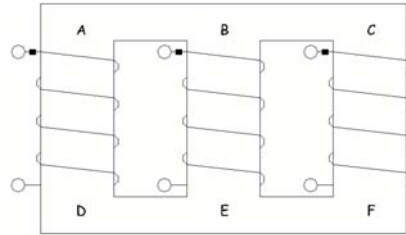
Comment:

OK Cancel Import Export Run ATP View + Copy + Help

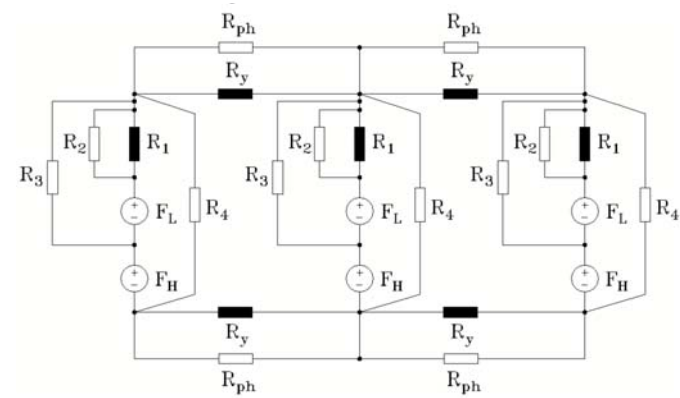
Hybrid Transformer model - XFMR

- The model includes:
 - an inverse inductance matrix for the leakage description,
 - frequency dependent winding resistance,
 - capacitive coupling,
 - and a topologically correct core model with individual saturation and losses in legs and yokes.
- The user can base the transformer model on three sources of data:
 - **Design parameter**: specify geometry and material parameters of the core and windings.
 - **Test report**: standard transformer tests.
 - **Typical values**: typical values based on the voltage and power ratings.

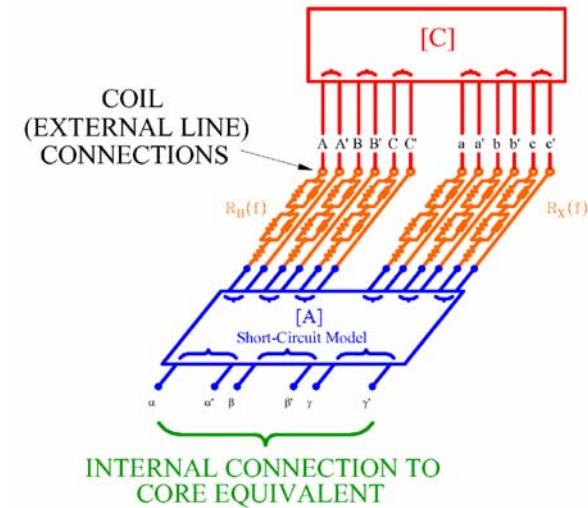
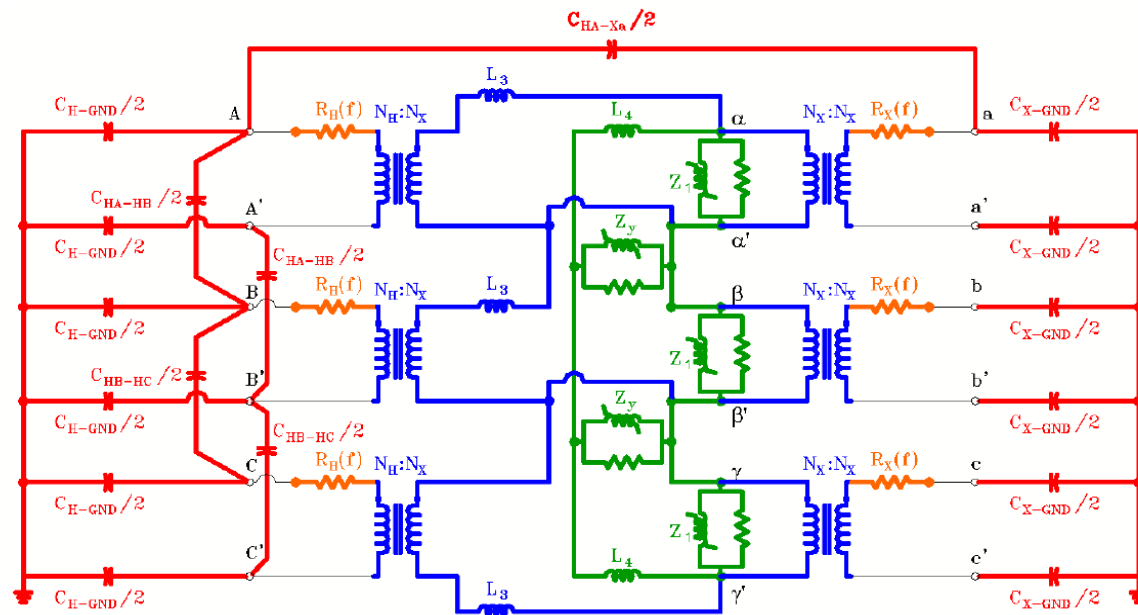
1. Physical Structure



2. Magnetic Circuit



3. Dual Electric Circuit, Hybrid Model

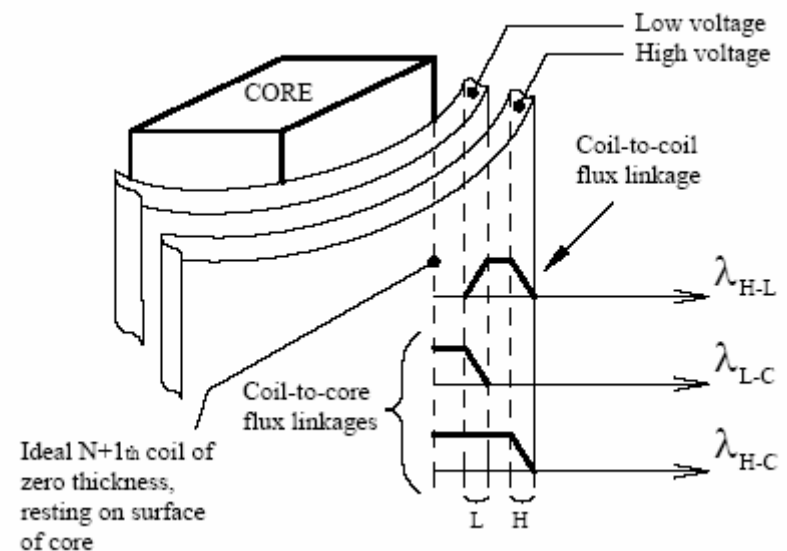


- Core representation
- Resistance
- Leakage representation
- Capacitive effects

– Leakage representation

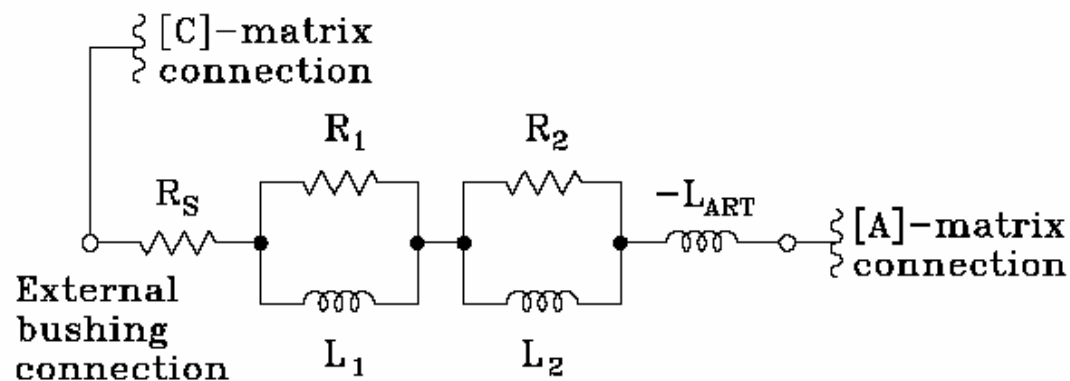
- Corresponds to the $[A] = [L]^{-1}$ matrix
- Takes into account the coils turn ratios
- Introduces artificial N+1th winding at core surface
- No mutual coupling between the phases

equivalent core is attached to a fictitious N+1th winding

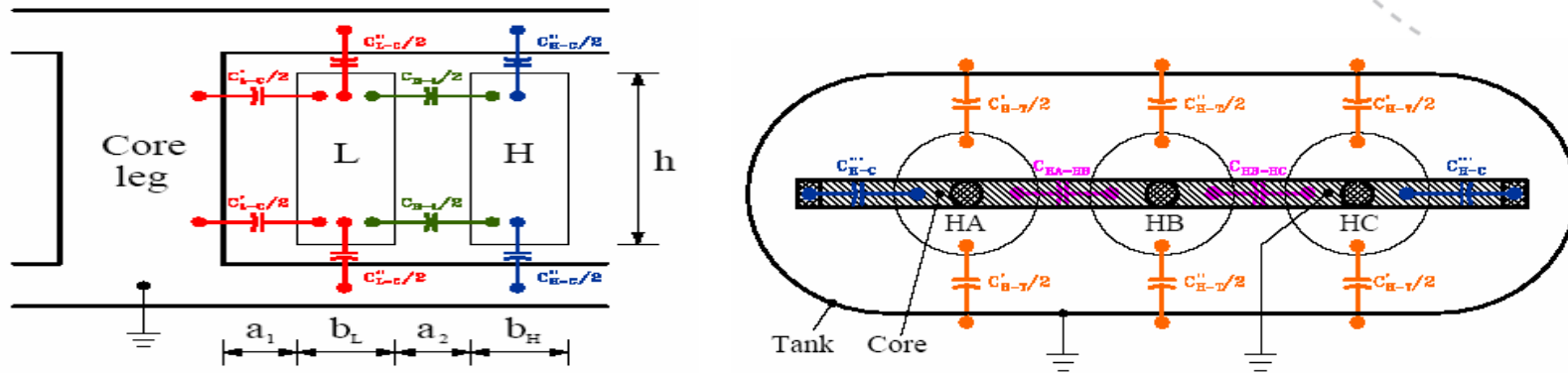


– Resistance (winding)

- Their dependence on the frequency is due to
 - Skin effects
 - Proximity effects
 - Eddy currents
- The frequency-dependency of R is represented using Foster equivalent circuit (two cells)



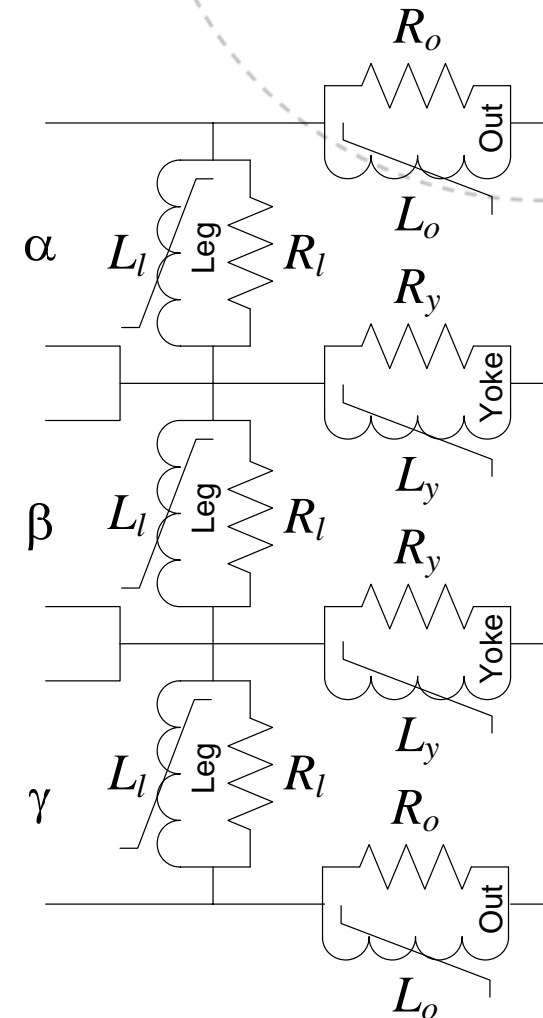
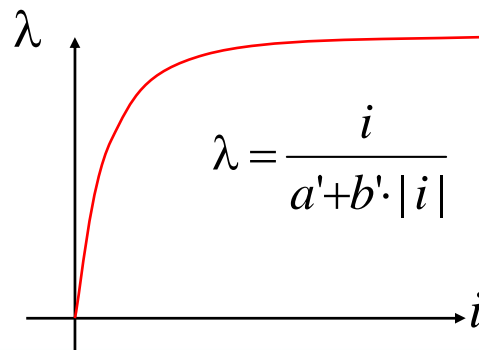
– Capacitive effects



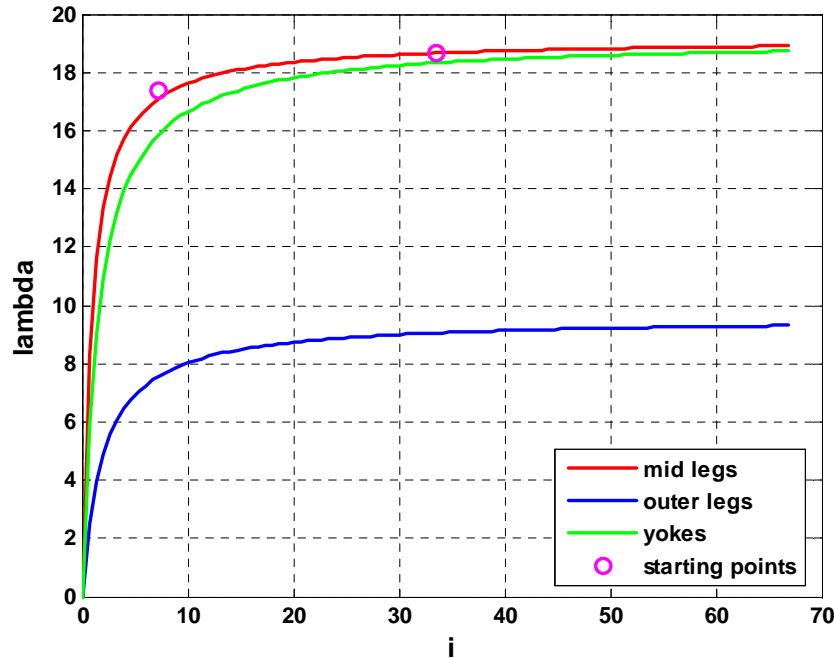
- Capacitances between high and low voltage windings and core
- Capacitance between high voltage phases, outer legs, and grounded elements

— Core representation

- Attached to the fictitious N+1th winding
- Topologically “correct” core model, with nonlinear inductances representing each leg and limb
 - Triplex
 - 3- and 5-legged core
- Flux linkage-current relation by Frolich equation and relative lengths and areas.
- Fitting to Test Report



Parameter Estimation, Test Report

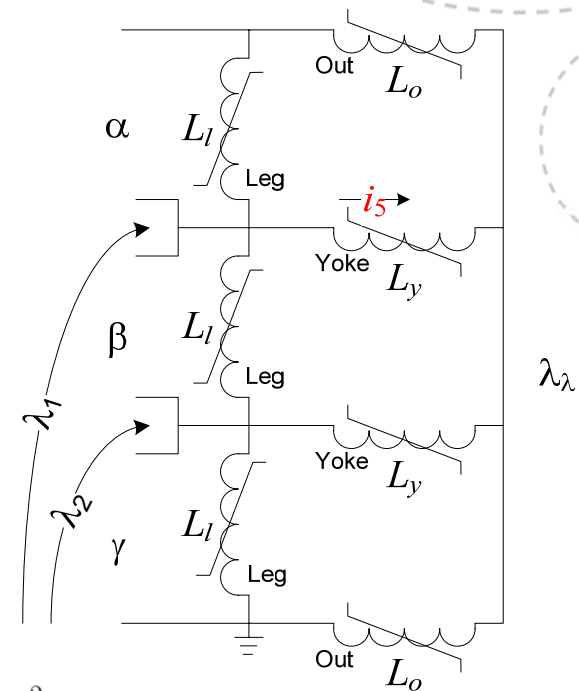


Nonlinear optimization routine, fitting test report

$$\text{Minimize } F(a, b) = \left(\frac{I_{rms,meas}@100\%V - I_{rms,calc}@100\%V}{I_{rms,meas}@100\%V} \right)^2 + \left(\frac{I_{rms,meas}@110\%V - I_{rms,calc}@110\%V}{I_{rms,meas}@110\%V} \right)^2$$

Relative areas and lengths

$$i_5 = \frac{l_y \cdot a \cdot (\lambda_1 - \lambda_\lambda)}{A_y - b \cdot |\lambda_1 - \lambda_\lambda|}$$



5-legged core

Snapshots

Hybrid transformer : C:\eeug\atpdraw\atp\SIMA.xfr

Structure

Number of phases: 3
 Number of windings: 2
 Type of core: 5-leg stacked
 Test frequency [Hz]: 50

Data based on: Ind. Res. Cap. Core
 Design param.
 Test report
 Typical values

Ratings & connections

	Prim.	Sec.
L-L voltage [kV]	432	16
Power [MVA]	290	290
Connections	Y	D
Phase shift		30
Node name	HV_X	LV_X
Winding sequence inner-middle-outer	S-P	<input type="checkbox"/> Ext. neutral connections

Data

Inductance Resistance Capacitance **Core**

Performed at: Sec Average currents Zero seq. available
 Insert Delete

positive sequence @290 [MVA]

Volt [%]	Loss [kW]	Iav [%]
75	83.1	0.05
87.5	118.8	0.11

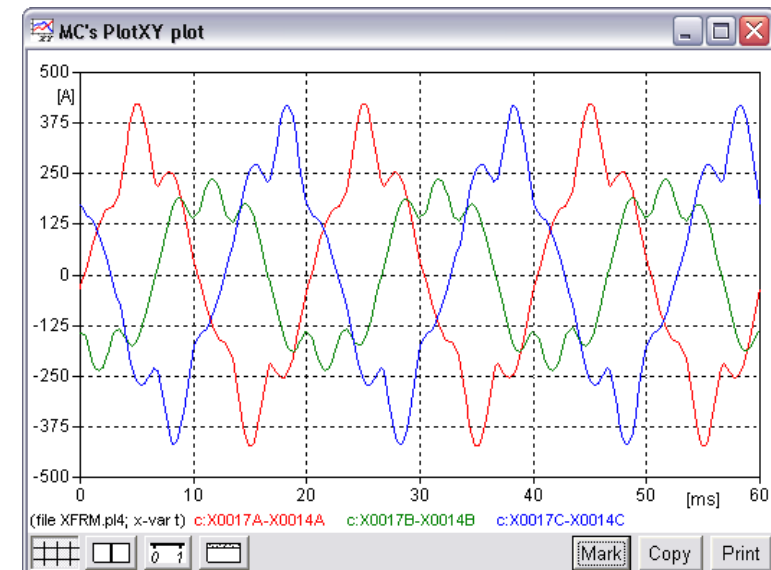
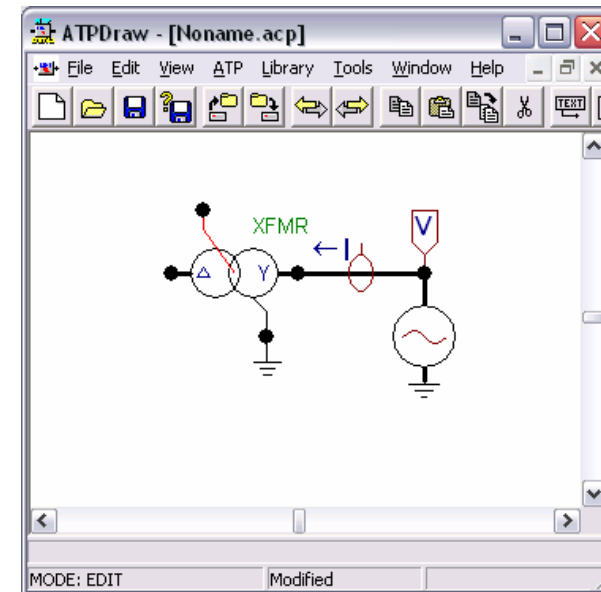
Relative dimensions

Ratios ref. leg	Area	Length
Yoke	0.54	1.5
Outer leg	0.54	2.5

Initialize
 View I/I
 View core
 Settings...

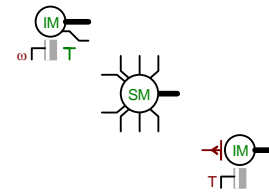
Order: 0 Label: Comment: Hide

OK Cancel Import Export Help



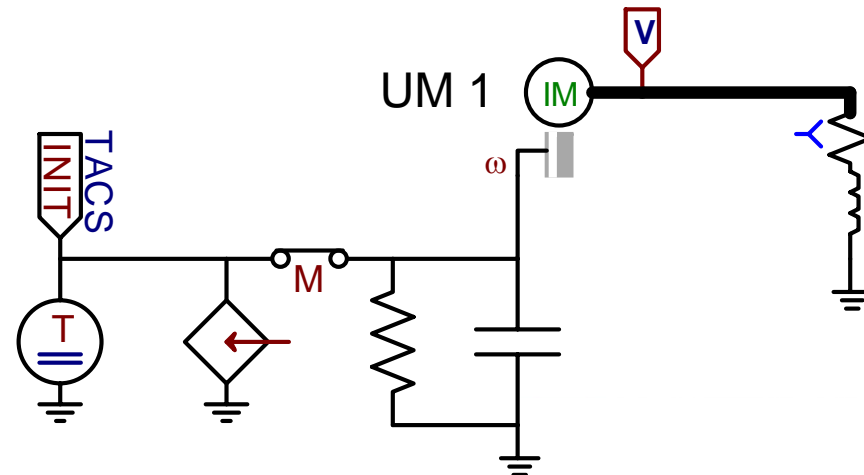
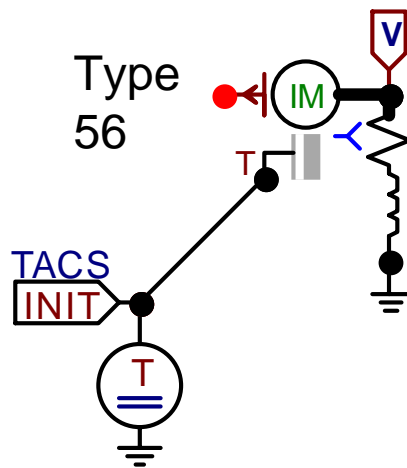
Machines

- The following types are supported
 - Universal machine
 - Type 59 synchronous machine
 - Type 56 induction machine
- Probably the weakest part of ATPDraw
 - Control of machines not standardized
 - Several machines (combinations) ?
- Plan for better support of WIndSyn



Type 56 machine

- Initial support in ATPDraw
 - Improvements required (TACS control, combination with UM)
- Brand new versions of ATP and PlotXY required
- More numerically stable (phase domain)
- Limitations on the mechanical side and in rotor coils



Models

- ATPDraw reads the Model text and identifies the circuit components with input/output/data
- Automatic creation of icon
 - User who insists on a special icon should create global Models in Library
- Indexed Nodes and Data supported
- Create a Model from scratch or load a predefined Model

Add a new Model to a circuit

- Select a mod or sup file from the global library

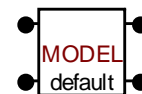


- If a sup-file does not exist, default data is used and icon automatically created

- Create a new Model

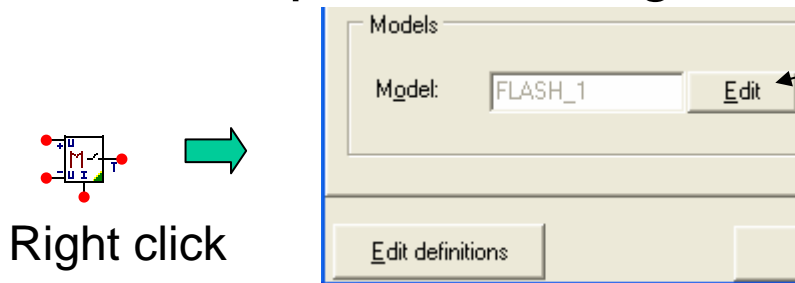


- Default Model is used (ModelDef.sup from ATPDraw.scl)
- Icon is automatically created



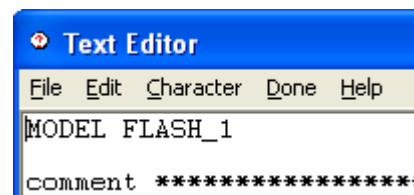
Edit a Model in a circuit

- In the Component dialog box click on Edit

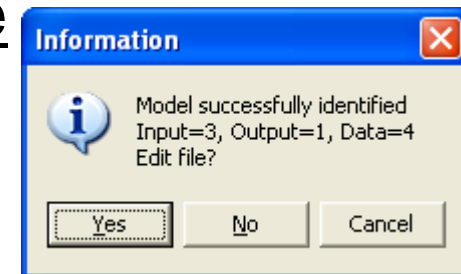


- The built-in text editor appears

- Edit the text/Import
- Click on Done

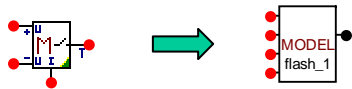


- Respond to the Model identified message

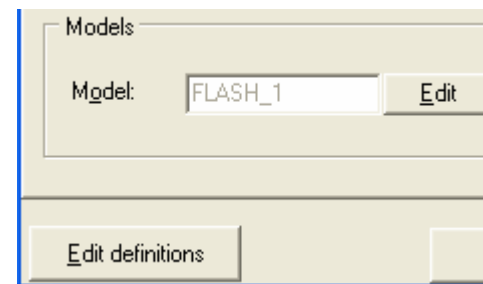
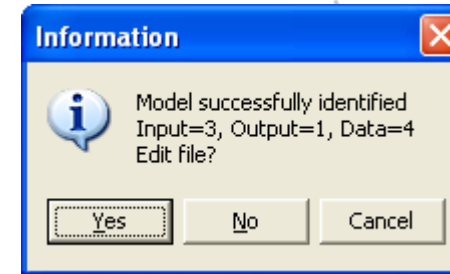


Go to Edit definitions

- Edit during identification
 - Click *Yes*: Go to Edit definitions
 - Click *No*: Accept default icon/node
- If the number of nodes has changed
 - ATPDraw will as default create a new icon in vector graphic style



- Edit definitions later
 - Click *Edit definitions*



Edit definitions

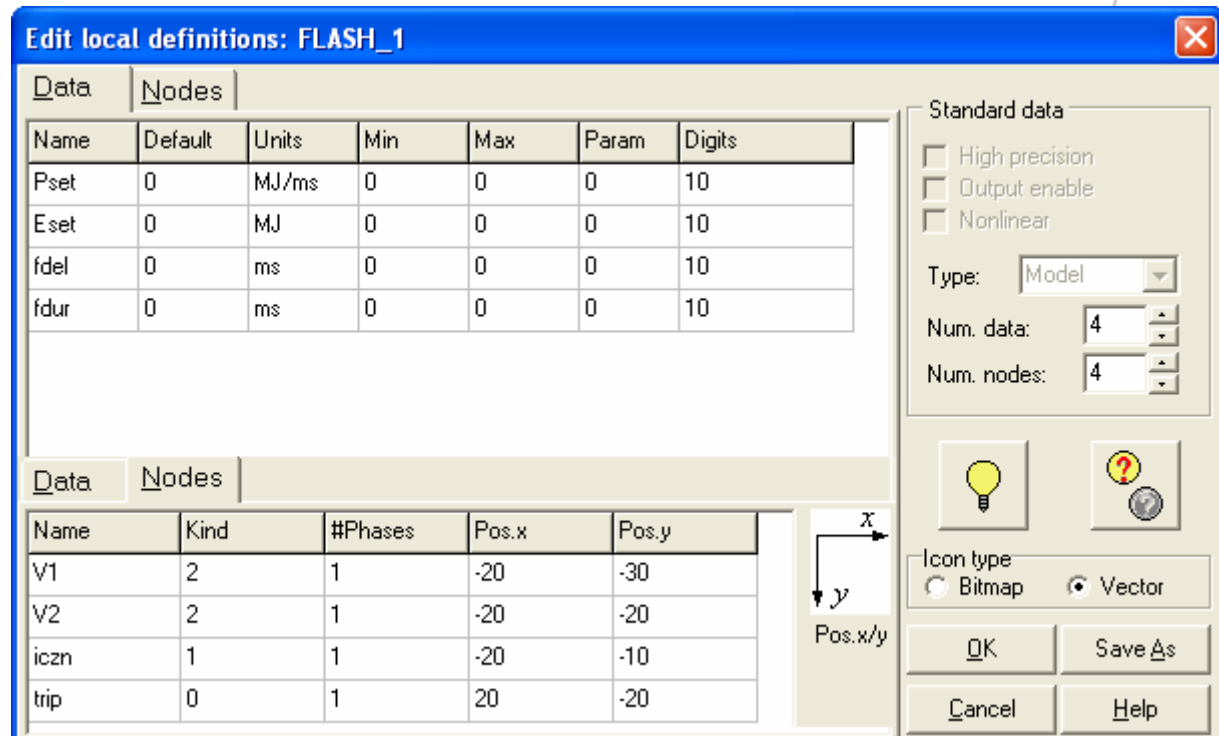
- Local: Component dialog|Edit definitions
- Global: Library|Edit|
- Edit data, nodes, icon, and help

Note:

Node positions changed from iconborder 1-12 to (x, y) positions

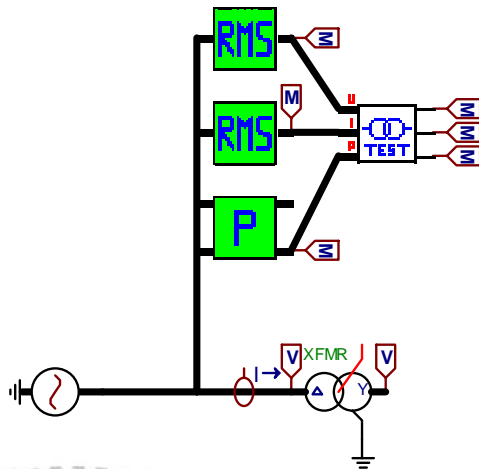
Switch between bitmap/vector

Data|Unit added



Example – Transformer tester

- Pocket calculator
- RMS and Power calculation
- TTester: Averaging, printout



```

Text Editor
File Edit Character Done Help
MODEL TTester
DATA FREQ, np, Us, Is, Ps
INPUT U[1..3], I[1..3], AP[1..3]
OUTPUT Volt, Curr, Pow
VAR Volt, Curr, Pow, Flag
INIT
  Flag:=0
ENDINIT
EXEC
  Volt:=0
  Curr:=0
  Pow:=0
  FOR p:=1 to np DO
    Volt:=Volt+sqrt(3)*U[p]/np/Us
    Curr:=Curr+I[p]/np/Is
    Pow:=Pow+AP[p]/Ps
  ENDFOR
  IF t>=2*recip(FREQ) AND Flag=0 THEN
    Flag:=1
    writel(Volt, ' ', Curr, ' ', Pow)
  ENDIF
ENDEXEC
ENDMODEL
  
```

ATP Settings

Simulation | Output | Switch/UM | Format | Record | Variables

\$PARAMETER settings

NAME	VALUE
V	816.5*(13.+KNT)

Number of simulations: 5

OK Help

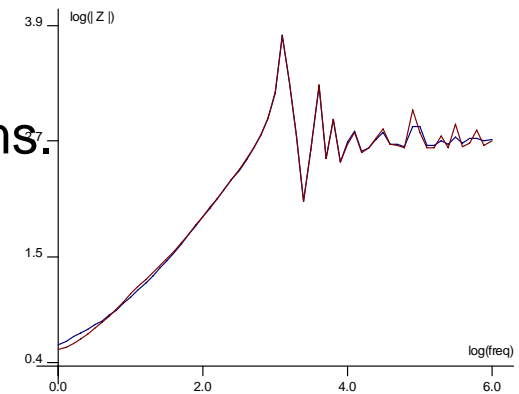
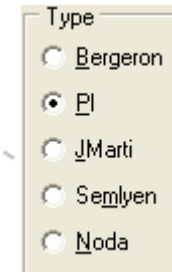
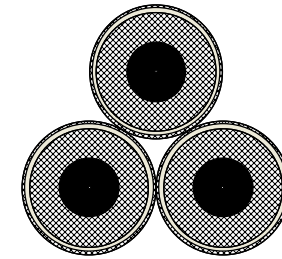
ResultDir\model.1

```

87.5003664 .17121764 131.434758
93.7503926 .220581306 151.751037
100.000419 .35109472 173.603833
106.250445 .743208151 196.896531
112.500471 2.85953651 221.288092
  
```

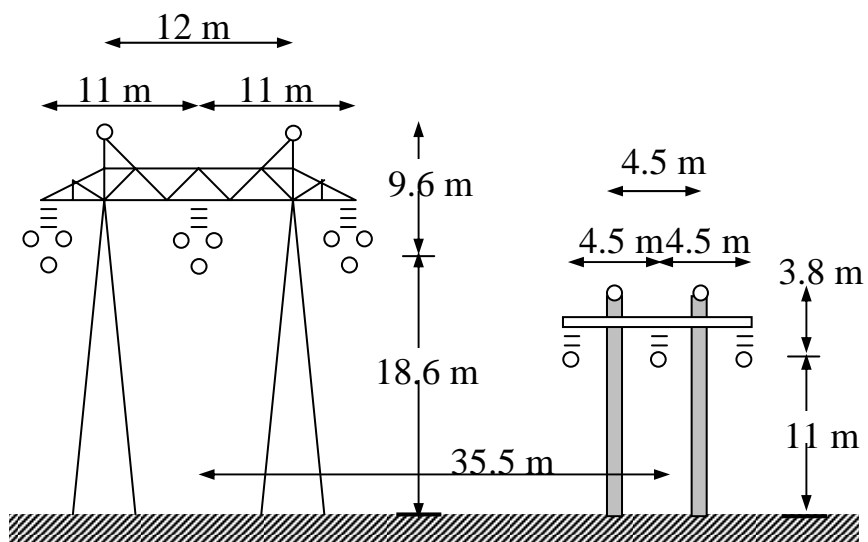
Line/Cable modeling

- Line/Cable Constants, Cable Parameters
 - Bergeron, PI, JMarti, Semlyen, Noda(?)
- View
 - Cross section, grounding
- Verify
 - Frequency response, power frequency params.
- Line Check
 - Power freq. test of line/cable sections



Example

- Double circuit case (420 kV + 145 kV)



Test type	Circuit [kV]	Positive sequence system		Zero sequence system	
		Z [Ω/km]	C [nF/km]	Z [Ω/km]	C [nF/km]
Benchmark data 50 Hz, 100 Ωm	420	0.02+j0.29	12.8	0.19+j0.71	9.3
	145	0.06+j0.38	9.7	0.25+j0.80	6.7
Individual testing Bergeron model	420	0.02+j0.29	12.8	0.18+j0.71	9.3
	145	0.06+j0.38	9.7	0.25+j0.80	6.9

Creating the Bergeron model

The screenshot shows two instances of the 'Line/Cable Data' dialog box. The left instance is in the 'Model' tab, and the right instance is in the 'Data' tab.

Model Tab (Left):

- System type: Overhead Line
- #Ph: 6
- Transposed:
- Auto bundling:
- Skin effect:
- Segmented ground:
- Real transf. matrix:
- Units: Metric (selected), English
- Model Type: Bergeron (selected), PI, JMarti, Noda, Semlyen
- Standard data: Rho [ohm*m] = 100, Freq. init [Hz] = 50, Length [km] = 1
- Comment: [Empty]

Data Tab (Right):

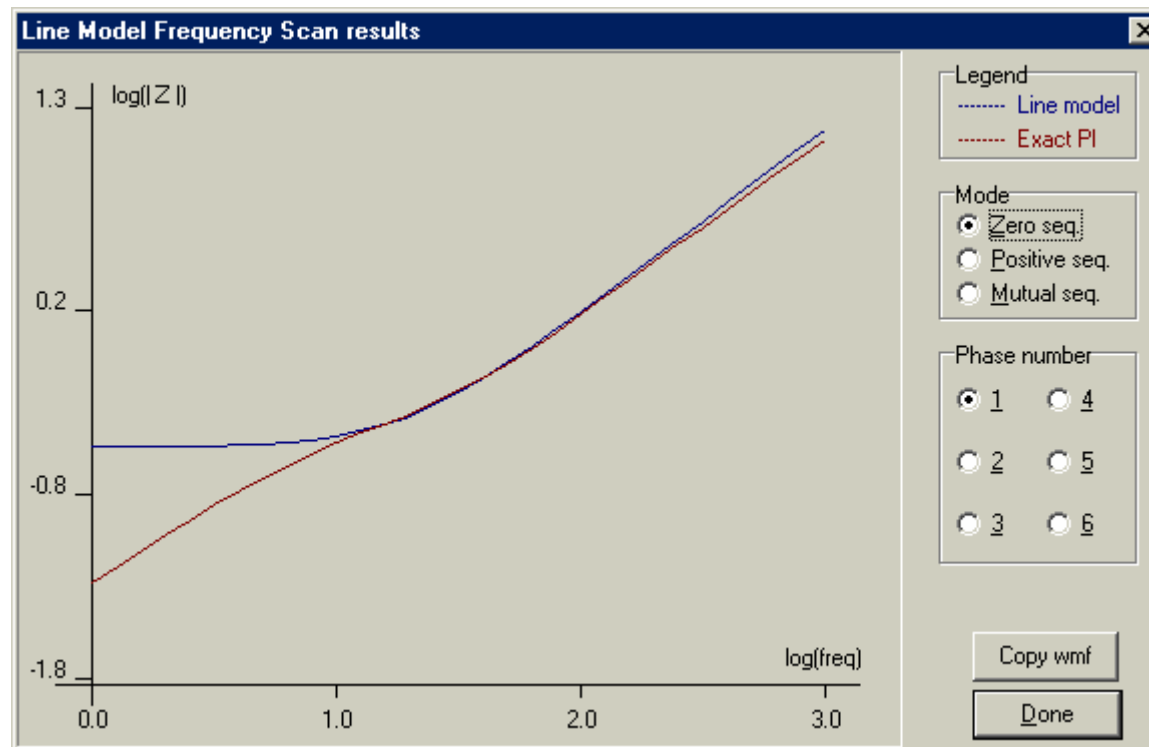
#	Ph.no.	Rin [cm]	Rout [cm]	Resis [ohm/km DC]	Horiz [m]	Vtower [m]	Vmid [m]	Separ [cm]	Alpha [deg]	NB
1	1	0.528	1.584	0.055	-11	18.6	8.6	45	30	3
2	2	0.528	1.584	0.055	0	18.6	8.6	45	30	3
3	3	0.528	1.584	0.055	11	18.6	8.6	45	30	3
4	4	0.528	1.584	0.055	31	11	6.7	0	0	0
5	5	0.528	1.584	0.055	35.5	11	6.7	0	0	0
6	6	0.528	1.584	0.055	40	11	6.7	0	0	0
7	0	0.206	0.617	0.359	-6	28.2	20.7	0	0	0
8	0	0.206	0.617	0.359	6	28.2	20.7	0	0	0
9	0	0.206	0.617	0.359	33.25	14.8	10.5	0	0	0
10	0	0.206	0.617	0.359	37.75	14.8	10.5	0	0	0

Buttons at the bottom of the Data tab: Add row, Delete last row, Insert row copy, Move (up/down arrows).

Buttons at the bottom of the dialog: OK, Cancel, Import, Save As, Run ATP, View, Verify, Edit icon, Help.

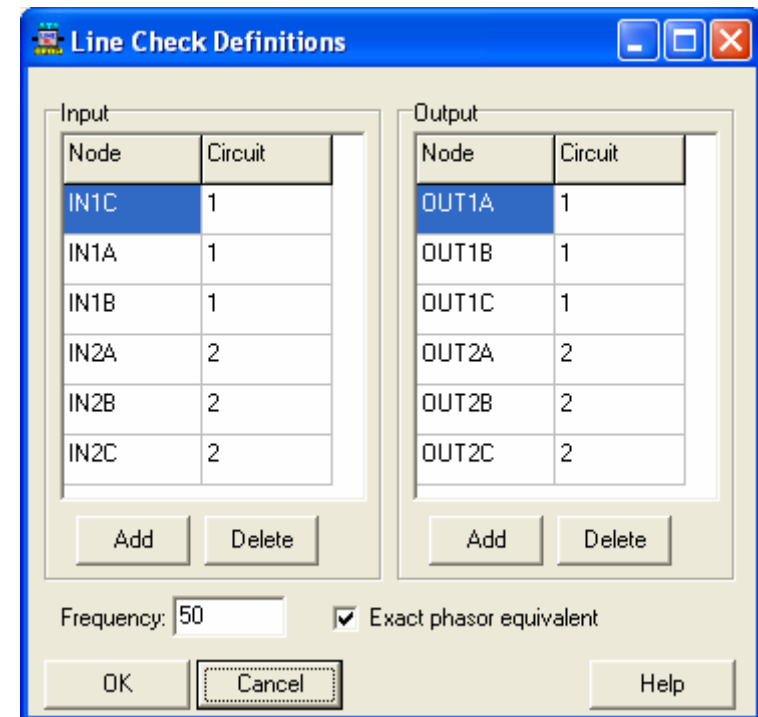
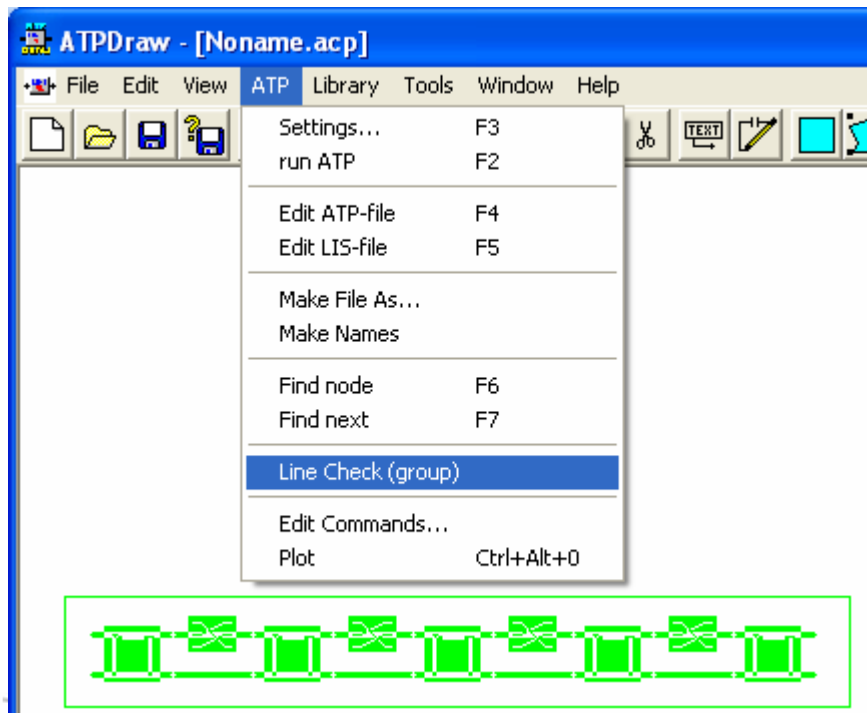
Testing the Bergeron model

- Line Model Frequency scan. Model OK for 50 Hz.



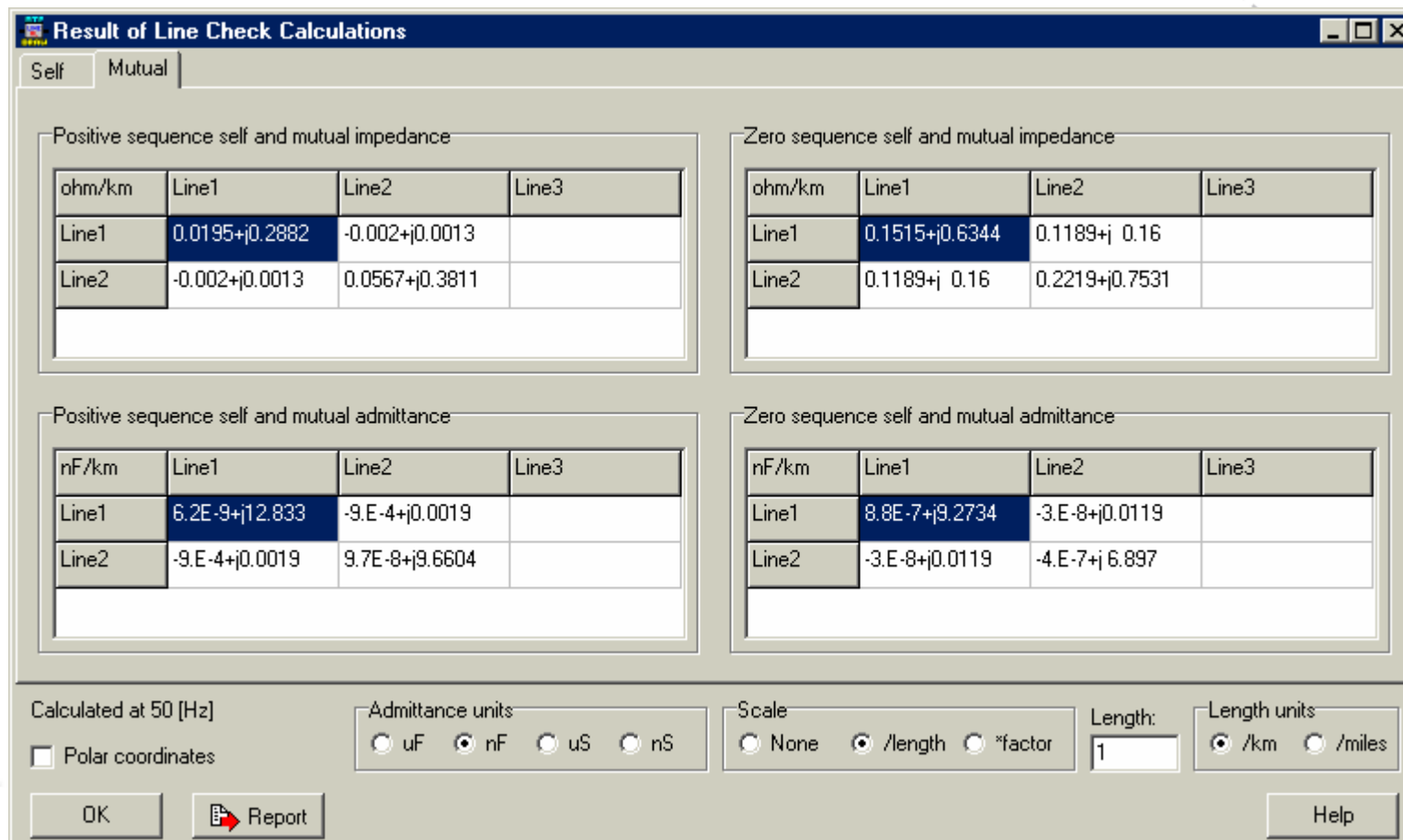
Line Check

- The user selects a group in the circuit
- ATPDraw identifies the inputs and outputs (user modifiable)



Line Check cont.

- ATPDraw reads the lis-file and calculates the series impedance and shunt admittance



Inrush scanning

- Find the maximum inrush current as a function of switching instant
 - Pocket calculator KNT+MNT
 - Write1 to MODELS.1

