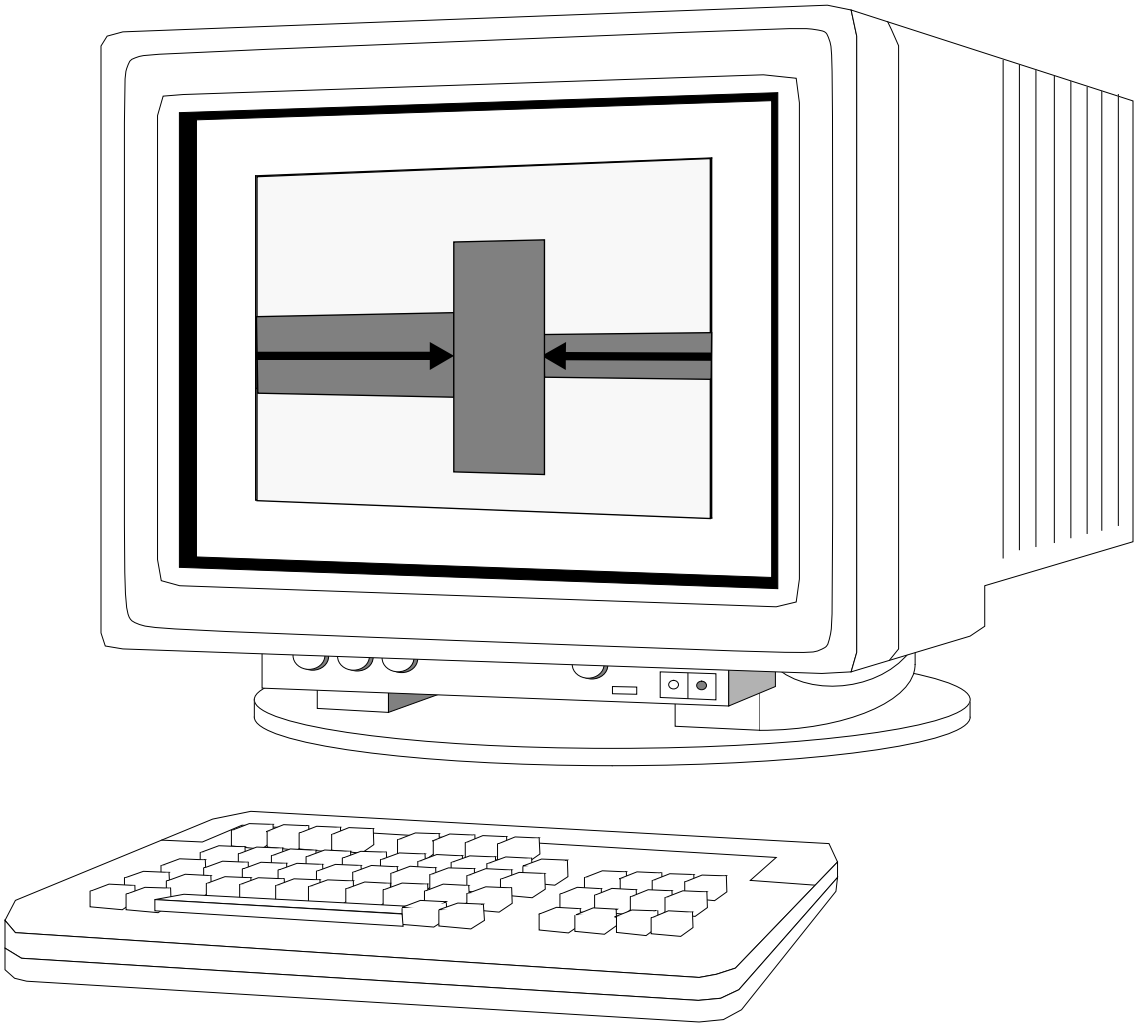
Emvu User's Manual



Emvu User's Manual

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Chapter 1 Introduction

Emvu is an X Window System, mouse based program used to view results from an ***em*** analysis as a color shaded plot. The colors can represent, for example, the magnitude of current density. By displaying a sequence of current density plots, for example, each one at a slightly different frequency, ***emvu*** can achieve real time animation.

Electromagnetic visualization, such as that provided by ***emvu***, provides a different kind of information as compared with the microwave tools we usually use. The standard microwave tools, such as the circuit theory based programs, and electromagnetic tools like ***em***, provide quantitative results. They can tell you if your circuit meets specifications and by how much.

In contrast, visualization tools are not primarily intended to give quantitative information. Rather, the information they provide is qualitative. For example, visualization does not tell you if your circuit meets specification, but they can answer questions like:

Qualitative Question: Why does my via have higher inductance than expected?

Visualization Answer: Because all the current flows down the nearest side of the via.

Qualitative Question: How can I reduce the inductance of the via?

Visualization Answer: By placing your via so that both sides of the via carry current.

Qualitative Question: Why doesn't any signal make it through my circuit?

Visualization Answer: Because, as the circuit was laid out, a capacitor was accidentally shorted to ground (easily seen due to the high current at the point of the short).

Qualitative Question: How do I estimate the electrical length around a "U-turn" bend?

Visualization Answer: The current flowing around a U-turn bend, as shown in a visualization plot, takes the shortest path with almost no current flowing on the outside edge. Thus the electrical length is about equal to the shortest path around the bend.

These, and many other questions which have already been answered, form the core of what promises to be an exciting new technology in microwave design. Questions and uses, not yet even a glimmer in an engineer's eye, still remain.

Emvu continues an important tradition at Sonnet, the elimination of software limits. Consistent with the Sonnet philosophy, ***emvu*** can display circuits with any number of ports, dielectric layers, and metal types. It also gives you the ability to change port characteristics and immediately see the effect on your circuit. In addition, ***emvu*** gives you the freedom to view your circuits using your own scale values or you may use ***emvu***'s autoscaling features. As an added feature, you may use ***emvu*** to see the variable size subsectioning used by ***em***.

♦ Requirements

Because of the nature of the software***, emvu*** requires a color monitor. Specifically, you need a non-static display supporting a minimum of eight planes. This is the only hardware requirement above that needed to run ***xgeom***.

♦ Organization of This Manual

Chapter 2 and Chapter 3 of this manual form a tutorial illustrating the use of ***emvu*** through examples. Chapter 4 forms a concise reference for ***emvu***'s functionality, suitable for use once one has a working knowledge of the program. The tutorial section of the manual requires about an hour to complete.

♦ A Brief Overview

Emvu is a visualization tool used to view circuits previously analyzed with ***em***. ***Em*** saves the resulting current density information in a file format ready for input to ***emvu***. Typically, the file ends with ".jxy", where "j" stands for current density. The "xy" refers to the directions of the current (z-directed current is not shown).

The plots shown with ***emvu*** give you new insight into the workings of your circuit by showing you the "hot spots" and "cold spots" of your circuit. You may then use this information to improve your design and your design skills.

The next chapter describes how to run ***emvu*** followed by a description of a typical session.

Chapter 2 An *Emvu* Example

The following sections describe an example of using ***emvu***.

♦ Getting Started

First, log into your account. At this point, system specific actions may be required which are not described here. If needed, consult your system administrator.

Now make and change to a new directory, type:

mkdir test

cd test

Next, if the X Window System is not already automatically running, start it. A (system specific) command like “xstart”, “x11start”,”xinit”, “openwin” or “motif” should do it. If not, again, seek assistance from another user or the system administrator.

Familiarity with the use of X Window System is assumed. If not familiar with the X Window System, obtain documentation for your system describing the use of the X Window System. A half hour spent using the X Window System is more than adequate.

There are several window systems, which provide a friendly “look and feel”, built on-top of X. These include Open Windows and Motif. Not included are proprietary window systems such as Sun View, which is, or will soon be, obsolete.

♦ Creating an *Emvu* File

For our example, we will use the cascaded steps example from the ***Em* User's Manual**. First copy the files “ctl.an” and “steps_sym.geo” from the Sonnet example directory by typing:

cp $SONNET_DIR/examples/ctl.an .

cp $SONNET_DIR/examples/steps_sym.geo .

The “ctl.an” file tells ***em*** to do the analysis at a single frequency of 10.0 GHz. The files “steps_sym.geo” is the geometry file for this example.

We will be creating a file called “cir.jxy”. Before we do this, first delete any existing file by the same name by typing:

rm cir .jxy

Now type

em -mvj steps_sym.geo

This command runs ***em*** and creates a current density output file called “cir.jxy”. The “-j” option tells ***em*** to create a current density file for use by ***emvu***. If you do not want the file to be called “cir.jxy” you may specify the name on the command line. If the file specified ends in “.jxy”, ***em*** uses this name as the current density file. For example, the command,

em -mv steps_sym.geo steps_sym.jxy

would create a current density file called “steps_sym.jxy”.

Note that the “-j” option tells ***em*** to output a current density file *in addition to* the regular response (“.rsp”) file.

WARNING

Do not specify a current density file that already exists. ***Em*** adds the new data to the end of the existing file, creating the potential for very large files. Also, ***emvu*** only reads in data from the first ***em*** run, ignoring any data from later runs.

♦ Running the *Emvu* Program

Once the X Window System is started, you can start ***emvu***, provided it has been properly installed (as described in the **Sonnet Installation Manual**). For our example, type the following command:

emvu cir .jxy

When you press return, ***emvu*** starts loading the file "cir.jxy".

Depending upon the speed of your computer, this may happen immediately, or you may have to wait a short time. The cursor symbol changes to a clock while ***emvu*** is loading in the data.

On your screen, a color plot of your circuit is shown (similar to Figure 1). Red areas represent high current density, and blue areas represent low current density. A scale is shown on the left of the window which defines the values of each color. To see a current density value, click on any point on your circuit. The current density value (in amps/meter) at the point that you clicked is shown at the top of your window.

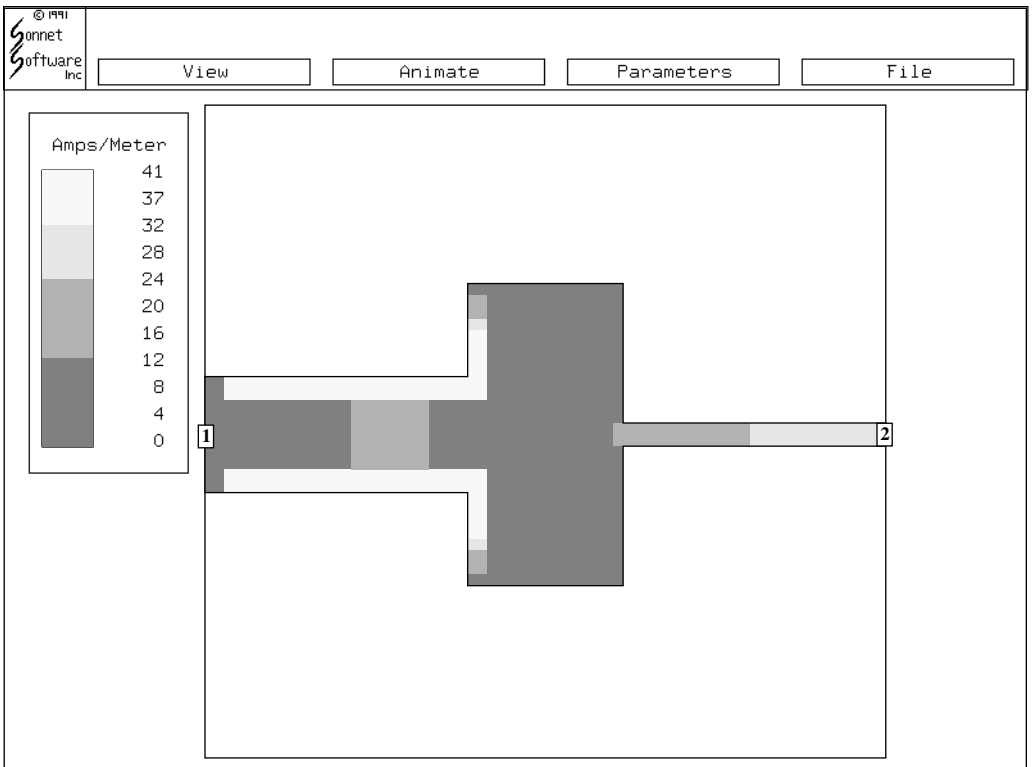

Figure 1 The ***emvu*** window showing the current density of the example circuit.

♦ The *Emvu* Command Line

The command that you typed to run ***emvu*** was:

emvu cir .jxy &

This brought up the ***emvu*** window and then loaded the file called “cir.jxy”. The “.jxy” at the end of the file name indicates a Current Density File which is generated as output by ***em***. All information about the current density of your circuit is stored by ***em*** in this file. The file name is not required to end in “.jxy”, but it is recommended.

The “&” at the end of the ***emvu*** command line causes ***emvu*** to run in background, which means the window in which you type the command line can still be used, even while ***emvu*** is still running. The “&” may be left off, however this locks the window until ***emvu*** terminates.

There are numerous command line options available for ***emvu***. They can be used to set, for example, window size and location, background and foreground colors, etc. These options are detailed in Appendix I, "The Emvu Command Line".

♦ Displaying the *Emvu* Window

What happens after typing the command line and pressing return is dependent on which window manager is running. In some cases, the ***emvu*** window simply appears.

Other systems may require some user input before displaying the ***emvu*** window. For example, a small, flickering rectangle may appear at the position of the cursor. Pressing the left mouse button expands the rectangle to the actual size of the ***emvu*** window. Moving the mouse allows the window to be positioned. Releasing the button causes the window to appear.

The ***emvu*** window may be moved and resized using system specific X Window System commands. Consult your X Window System documentation.

♦ What You are Seeing

The color plot shows the current distribution of your circuit as analyzed by ***em***. The magnitude of the current density, in amps/meter is calculated for each subsection and then plotted using the color scale shown in the left part of the ***emvu*** window.

In our example, notice the red “bands” at the edge of the line connected to port 1. This shows the classical microstrip current distribution where the current “hugs” the edge. Areas where the color changes abruptly represent boundaries between subsections.

♦ *Emvu* Button Menus

To “press” a button, move the mouse so that the cursor is on one of the buttons. For example, move the mouse so that the cursor is on the “Parameters” button. Press (and hold down) the left hand mouse button. The ***emvu*** button is highlighted (changes color) and a menu appears. To select a menu item, such as “Subsections”, move the mouse so that “Subsections” is highlighted and then release it. The subsections of your circuit will now be shown. This circuit uses symmetry, so only half of the circuit needs to be subsectioned. Click on “Subsections” again to turn the subsections back off again.

The main button menu is the only button menu in ***emvu*** which uses “hold and drag”. All other button menus are “click”, i.e., press and release.

Notice that some menu items have an ellipsis (...) after them. This means that this item calls another button menu. These menu items require more information before an action can take place. Other menu items (such as the “Subsections” option under the “Pa-

rameter" menu) have a word in angle brackets ("< >"). These items are toggles. Clicking on an item marked "<On>" turns that particular attribute off and clicking on an item marked "<Off>" turns that attribute on.

Some menu buttons have a shortcut key associated with them. This is shown in parentheses at the end of the name of the menu item. Typing this key has the same effect as "pressing" the menu button but you don't need to go through the menus. Most of the shortcut keys are "control" keys, i.e. you must first hold down the Control key, and then press the key. Any time you see a "^" symbol before a letter, e.g., "^U", you should interpret this as meaning a control key. A list of the shortcut keys is found in section "Keyboard Short Cuts" on page 26 of this manual.

Most button menus have a "Done" or "Skip" button as the right most button. Clicking on this button returns you to the next higher menu level, eventually always ending in the main button menu.

♦ Changing the Scale

The values for each of the colors of your plot are shown on the scale at the left of your ***emvu*** window. For our example, values between approximately 32 amps/meter and 41 amps/meter are shown in varying shades of red. Values of approximately 28 amps/meter are shown in yellow, etc. Values larger than the maximum value of the scale are shown in the brightest red and values less than the minimum are shown in the darkest blue.

When ***emvu*** first starts, it chooses a reasonable scale based on the actual values of your data. You may find, however, that your area of interest is all one color and conveys little intuitive information. To make your plot more useable, you should change the scale.

Move the mouse to the "Parameters" button (on the main button menu). Press and hold down the left mouse button. When the button is pressed, a menu appears below the "Parameters" button. Note that the cursor has changed shape. While holding the mouse button down, drag the cursor down until the "Scale" item is highlighted and then release the button. The button menu (see Figure 2) then appears, replacing the main button menu.

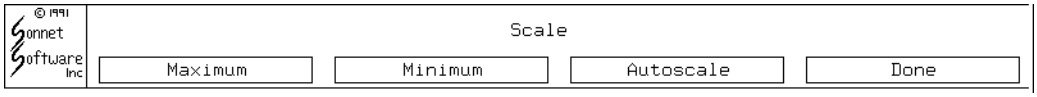

Figure 2 The Scale button menu allows specification of the scale used for plotting.

If, for some reason, no item on the menu is wanted, just move the mouse off the menu so that no item is highlighted and then release the mouse button.

To illustrate the use of the scale selections, move the cursor on to the "Maximum" button. Click (i.e., press and release) the left mouse button. The button menu is then replaced by a prompt asking for the desired maximum scale value for plotting. The prompt also informs you of the present value if applicable.

For this example, we want a maximum value of 25 amps/meter. Do this by typing the number "25" and pressing return. The mouse location is not critical.

Just pressing return without typing anything else causes the present value to remain unchanged. This is typical of ***emvu*** prompts.

After the prompt is answered, the button panel returns to the original scale display, and the plot is redrawn with the new scale. Notice that the plot has more red in it now. Do not click on "Done" yet. We must still talk about the "Autoscale" button.

♦ Autoscaling

You may specify the plotting scale two different ways: by specifying minimum and maximum values, or by having ***emvu*** choose a scale for you. In the above section, the "maximum" value was specified.

You may have ***emvu*** "autoscale" your plot. This is most useful in getting starting values for a plot and for animating (discussed later). To do this, you need to specify an autoscale factor. When this option is used, first ***emvu*** calculates the standard deviation and average current density over the entire metal region on the current level. It then sets the maximum scale according to the following formula:

maximum = average + (autoscale factor) * (standard deviation)

For example, entering in an autoscale factor of "3" sets the maximum value to the average plus 3 standard deviations. The minimum scale value is set to zero.

Emvu uses an autoscale factor of 1 as the default. This value is used when ***emvu*** first starts up and when a new file is loaded in.

For our example, click on “Autoscale”, type in a value of “1” and press return. This changes the plot back to it’s original scale. Now click on “Done” to return to the main button menu.

♦ Describing Button Presses

In the rest of this manual, we describe accessing the menu items of ***emvu*** using a “pointer” description illustrated with *Parameters* ⇒ *Scale* ⇒ *Autoscale* which describes the menu item we just exercised. Summarizing: *Parameters* ⇒ *Scale* ⇒ *Autoscale* means to press (and hold down) the left mouse button on “Parameters” in the main button menu. Then drag the mouse down until “Scale” is highlighted in the menu which just popped up. Then release the button and the button menu changes. Then click on “Autoscale”.

♦ Changing Port Values

Emvu allows you change the characteristics of any or all ports. Select *Parameters* ⇒ *Ports*. A new menu appears (see Figure 3).

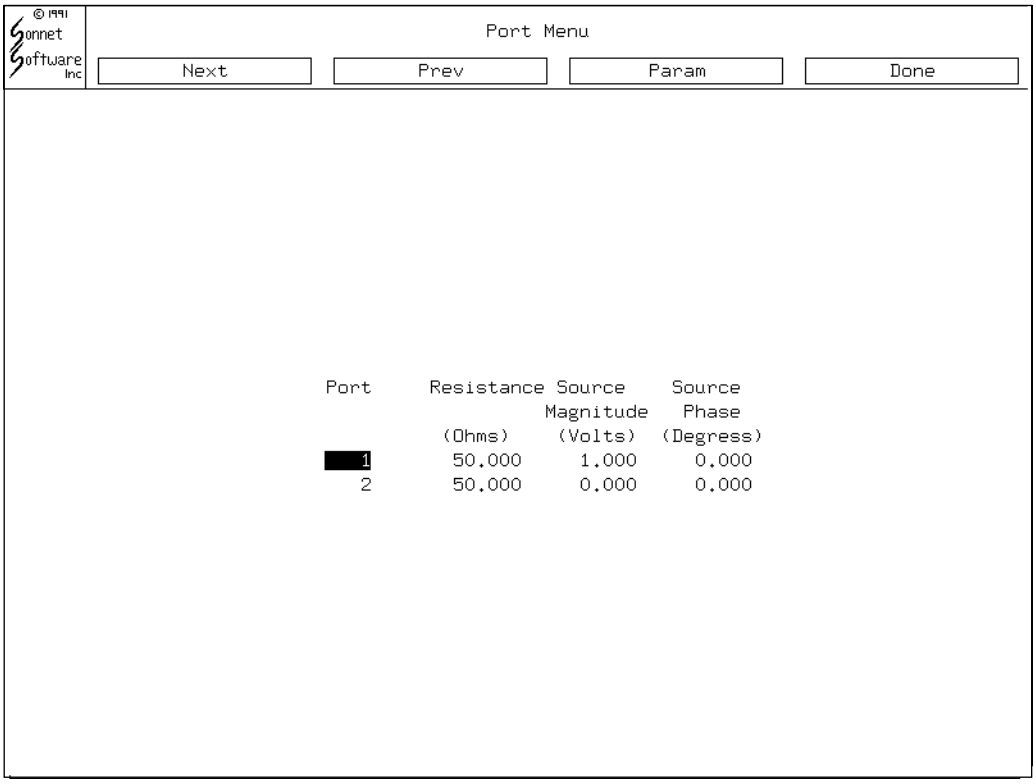

Figure 3 The Port menu allows you to change the characteristics of each port.

You may change the resistance, source voltage magnitude, or source phase of the port by clicking on the value that you want to change and typing in the new value. If you wish to change all of the characteristics of a port at once, click on the port number or use the “Next” and “Previous” buttons to highlight the port that you want to change. Then click on “Param”. You are prompted for all new values of that port. To keep the values the same, just hit return.

For our example, let's change the resistance of port 2 to 10,000 ohms. To do this, click on the "50.000" for port 2 and enter "10000". Now click on "Done" to get a new plot. Notice that the current near port 2 is low (blue). This is because the 10,000 ohms is causing port 2 to act like an open circuit.

NOTE

Emvu sets all port reactances. capacitances, and inductances to zero, regardless of what was specified in ***xgeom***. Only the resistance is read by ***Emvu***.

♦ Finishing the *Emvu* Program

This is the end of the first example of using ***emvu***. To stop the program, select *File* ⇒ *Quit.*

Chapter 3 Animation

The previous example was analyzed at only one frequency point. In the next example, we will analyze at many points and exercise the animation features of ***emvu***.

To do an animation, ***emvu*** takes a picture of your circuit at each frequency point and links the pictures together to form a “movie”. This allows you to see, at a glance, how your response changes with frequency, giving you insight into the properties of your circuit.

♦ Starting the Animation Example

First we need to analyze a circuit at multiple frequency points. Let's use the same cascaded steps file from the previous example and analyze it from 10 GHz to 25 GHz. To do this, edit the file called "ctl.an" so that it looks like Figure 4. For assistance in file editing, see the appendix of the **Em Manual** for an introduction to the "vi" editor.

```
VER 2.3
GHZ
FRE 15 25 1
```

Figure 4 The "ctl.an" file needed for the next example.

We will create a new ".jxy" file called "animate.jxy". First, if there is a file called "animate.jxy", remove it. Now analyze the circuit at the new frequency points by typing:

em -mv steps_sym.geo animate.jxy

When this is finished, call up ***emvu*** by typing:

emvu animate.jxy

As the new current density file is loaded in, your cursor changes to a clock symbol. When the file has finished loading, your cursor changes back to normal, and the new current density plot is displayed at the lowest frequency (in this case 15 GHz).

♦ The Frequency Menu

You may now look at other frequencies. Select *Parameters* ⇒ *Frequency.* A new button menu appears (Figure 5). Click on "Next" or "Previous" to manually sweep through the frequencies. Click on "Last" to view the highest frequency. If you wish to

look at a particular frequency, click on “Value” and type in the new frequency. If the frequency that you typed does not exist, the closest frequency value is displayed. Click on “Done” to exit this menu.

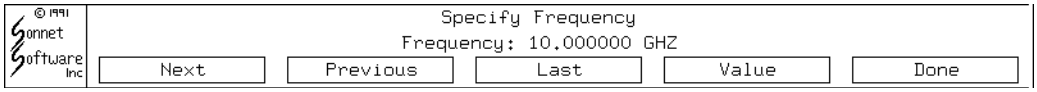

Figure 5 The Frequency button menu allows you to change the frequency.

♦ The Animation Menu

A smoother way to sweep through your frequencies is to use the “animation” feature of ***emvu***. Select *Animate* ⇒ *Load*. Your cursor changes to a clock symbol while ***emvu*** is loading the animation data. A new button menu appears when the loading is complete (see Figure 6).

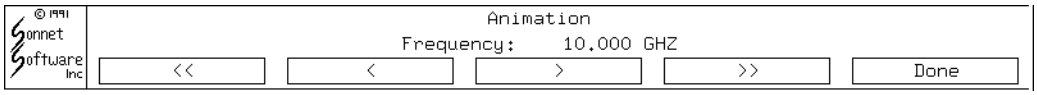

Figure 6 The Animation button menu allows you to sweep through your frequencies automatically.

The animation menu allows you to step through different frequencies one at a time or to show a “movie” by doing a continuous frequency sweep.

When the animation menu first comes up, the first frequency is displayed. Click on “>” to display the next frequency. To view the previous frequency, click on “<“. To do a frequency sweep, click on “>>” to go forward and “<<”to go backward.

For our example, click on “>>” and notice how the plot changes with frequency especially at higher frequencies.

The animation uses the present parameter settings as set by the Parameters menu. When using the “Autoscale” feature, each frame is rescaled according to the autoscale factor entered.

Click on “Done” to finish animating. The main button menu appears again.

♦ Finishing the Animation Example

This is the end of the second example and the tutorial of using ***emvu***. To stop the program, select *File* ⇒ *Quit.* The next chapter contains a detailed description of ***emvu***'s functionality.

Chapter 4 *Emvu* Function Reference

This section contains a brief, yet detailed description of ***emvu***'s functionality. It assumes you have read the previous tutorial and understand ***emvu***'s basic framework and purpose. Details on ***emvu***'s command line can be found in Appendix I, "The Emvu Command Line".

♦ The Mouse

Emvu uses only the left mouse button (See Figure 7). The middle and right mouse buttons are not used by ***emvu***.

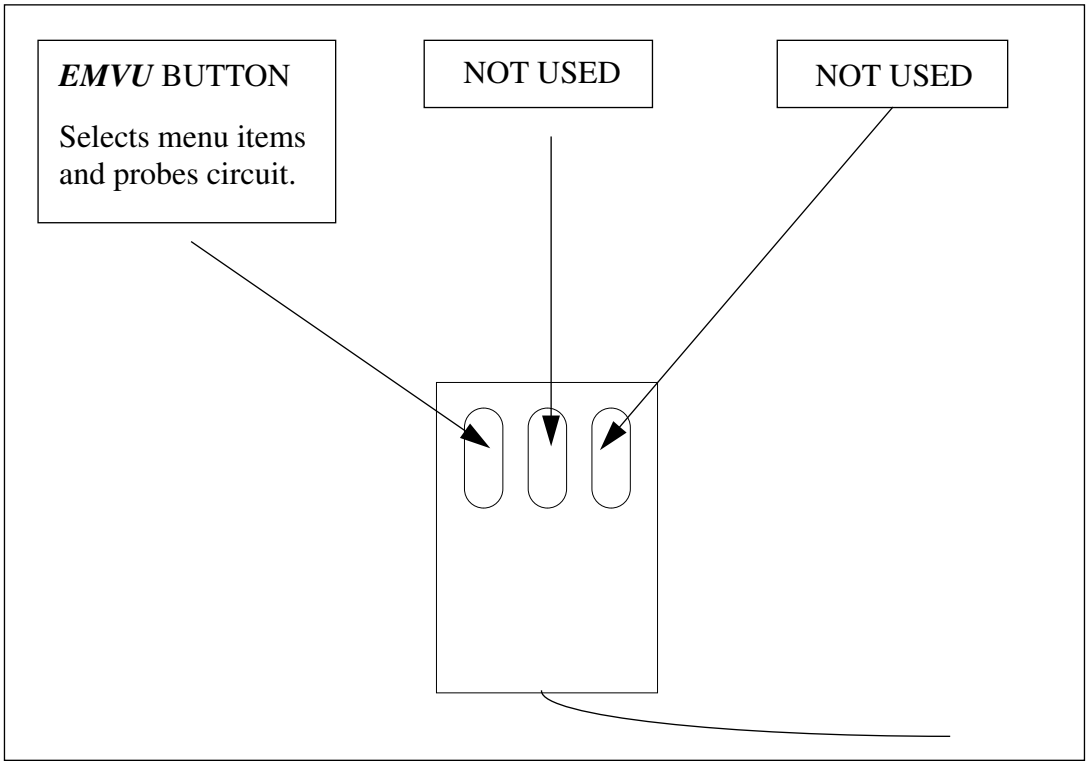

Figure 7 ***Emvu*** uses only the left mouse button.

♦ Probing Your Circuit

You can find out what the current density is at any location in your circuit by "probing" your circuit. To do this, first make sure that you are in the main button menu. Now, click the left mouse button at the location on your circuit that you wish to probe. The value is displayed at the top of your ***emvu*** window.

♦ Running Out of Memory

If you find that you are running out of memory, here are some suggestions for decreasing your memory usage:

1. Reduce the size of your ***emvu*** window *prior* to selecting *Animate* ⇒ *Load.* Memory usage is a strong function of the size of your window. Resizing the window *after* using *Animate* ⇒ *Load* has no effect on memory usage.

2. Reduce the number of frequencies. In our example, we have analyzed at only 1 frequency.

3. Check for other processes using memory. See your UNIX documentation on the "ps" command.

♦ Limitations

There are a few limitations of ***emvu*** plots that you should be aware of:

1. The current densities plotted do not represent de-embedded data. Therefore, areas near any port include the effect of the port discontinuity.
2. Only x- and y-directed current are plotted. Z-directed current (from vias) is not displayed.
3. The triangular part of diagonal subsections is not shown. However, the current density leading up to the diagonal subsections is correct.
4. Port reactances, capacitances, and inductances are all set to zero, regardless of what was specified in ***xgeom***. Only the port resistance is used. ***Em*** does not have this limitation.

♦ Making an *Emvu* Button Menu Selection

To "press" an ***emvu*** button, using the mouse, position the cursor over the desired button. Press the left button and a menu appears. Holding the button down, drag the cursor down until the desired item is highlighted. Then release the button. If the button is released while the cursor is outside the menu, no action results.

Once a menu item is selected, a new button menu is usually displayed. For this, and all remaining button menus, just click the mouse button, do not hold it down, to make a selection.

To describe selecting ***emvu*** button menu options, we use special notation. For example, *Parameters* ⇒ *Frequency* ⇒ *Next* means to move the mouse to the "Parameters" button in the main button menu, press and hold down the left mouse button, drag the mouse down the menu which appears until "Frequency" is highlighted, and release the button. When the new button menu appears, click on "Next".

Occasionally, keyboard input is required. In this case, an appropriate prompt appears on the button menu and anything you type appears there also. Pressing return without typing anything leaves the present value of the parameter unchanged.

Each button is described in the following sections. You may want to experiment with an example file such as “raystub.jxy”. To do this, type:

emvu $SONNET_DIR/examples/raystub.jxy

♦ The View Menu Button

Currently, there is only one item under the View menu: *View* ⇒ *Redraw*. This menu button will be expanded in future releases.

✧ Menu: View - Redraw

Use *View* ⇒ *Redraw* to redraw the ***emvu*** window.

♦ The Animate Menu Button

✧ Menu: Animate - Load

Use *Animate* ⇒ *Load* to load in the animation data. This may take a while for circuits analyzed at many frequencies. For runs with many frequencies, you may want to use a smaller window. This will reduce the memory requirements, speed up the loading process, and give you a smoother animation. To do this, resize your window *prior* to selecting *Animate* ⇒ *Load*.

The cursor changes to a clock while ***emvu*** is loading the animation data. When the load is complete, the cursor changes back and a new animation menu is displayed.

The animation menu allows you to step through different frequencies one at a time or to show a “movie” by doing a continuous frequency sweep.

When the animation menu first comes up, the first frequency is displayed. Click on “>” and the next frequency is displayed. To view the previous frequency, click on “<“. To do a frequency sweep, click on “>>” to go forward and “<<” to go backward.

The animation uses the present parameter settings as set by the Parameters menu.

NOTE

When the scale is set using the "Autoscale" option, each frame of the animation is rescaled. To animate with a constant scale, use *Parameters* ⇒ *Scale* ⇒ *Maximum* or *Parameters* ⇒ *Scale* ⇒ *Minimum*.

Click on "Done" when you are finished animating.

✧ Menu: Animate - Speed

Use *Animate* ⇒ *Speed* to change the time that each frame is displayed in seconds. The default setting is "0" which corresponds to the fastest speed. Higher numbers result in a slower animation. Reasonable values range from 0 to about 5.

♦ The Parameters Menu Button

The Parameters menu button allows specification of the frequency, scale, level, color map, and ports. It also allows viewing of the subsections to be turned on or off. When a parameter is changed, the plot is updated immediately to reflect the changes. Use "all" to change multiple parameters at a time.

✧ Menu: Parameters - Frequency

Parameters ⇒ *Frequency* changes the frequency that is displayed. Selecting *Parameters* ⇒ *Frequency* displays a new button menu. You may step through the frequencies by using "Next" and "Previous" or you may go to the last frequency by clicking on "Last". Click on "Value" to type in a frequency directly. If the frequency typed in does not exist, the nearest existing frequency is chosen. Click on "done" to return to the main menu.

✧ Menu: Parameters - Scale

Parameters ⇒ *Scale* changes the scale of the plot. The present settings are shown on the side of the window next to the color strip. Click on “Maximum” and/or “Minimum” to change the maximum and minimum values of the scale. Click on “Autoscale” to get a good starting value for the scale. The initial scale when ***emvu*** is started is set to an autoscale factor of 1.

NOTE

The autoscale factor entered changes the minimum and maximum values for the scale. Choose either a “Maximum” and “Minimum” setting or an “Autoscale” setting.

✧ Menu: Parameters - Levels

Select *Parameters* ⇒ *Levels* to change the level that is displayed (see Figure 8). The levels are numbered starting with 0 for the uppermost and working down. As a short cut, you can type ^U to move up one level and ^D to move down one level. Also, on many workstations, the “up arrow” and “down arrow” keys function the same as ^U and ^D.

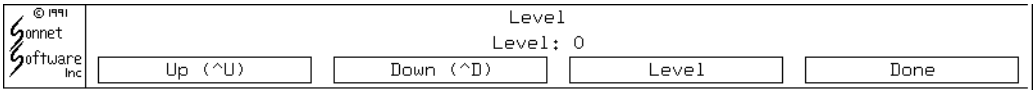

Figure 8 The Level button menu allows you to move from one level to another.

✧ Menu: Parameters - Ports

Parameters ⇒ *Ports* displays the present values of port parameters. By default, port 1 is a 50 ohms source (1 volt, 50 ohms) and all other ports are 50 ohm loads (0 volts, 50 ohms).

To change a value, click on the value that you wish to change and type in the new value. For example, to change the source from port 1 (default) to port 2, click on the value "1.000" for port 1 and change it from 1.000 volts to 0 volts. Then change the voltage of port 2 from 0 volts to 1 volt. To change all of the values for a port, click on that port number, or click on "Next" and "Prev" until the appropriate port is highlighted. Then click on "Param" and you are prompted for new values. Hit "Return" to leave a value unchanged.

✧ Menu: Parameters - Subsections

Parameters ⟹ *Subsections* toggles the display to show the subsections of your circuit as analyzed by ***em***. Click on "Subsections <Off>" to toggle the subsections from "off" to "on". Remember, when your circuit has been analyzed with symmetry, only half of your circuit is subsectioned.

✧ Menu: Parameters - Color Map

Parameters ⟹ *Color Map* allows the user to install alternate color maps. There are two choices: color (default), and gray.

✧ Menu: Parameters - All

Parameters ⟹ *All* shows the present settings of all parameters and allows you to modify any or all of them (see Figure 9). To change a value, click on the value that you want to change and type in the new value.

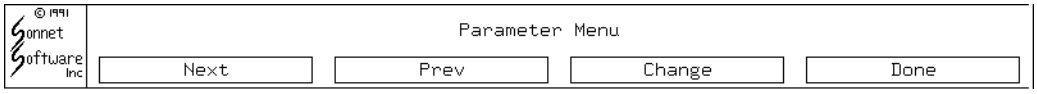

Figure 9 Select *Parameters* ⟹ *All* to obtain the parameter menu. Any parameter may be modified through this menu.

Since there are too many port parameters to fit on one line, port information must be changed via a second menu. To change port parameters, click on "Ports" and the port menu appears. Click on "done" and ***emvu*** redraws the plot with the new changes.

♦ The File Menu Button

✧ Menu: File - Load

Select *File* ⇒ *Load* to load a file in from disk. ***Emvu*** asks for the file name and then loads in this file from the default directory. If you do not know the name of the file, simply open a window and use the Unix "ls" command. You can of course specify full path names as "/home/john/filter.jxy" or relative path names as "john/filter.jxy". However, wildcarding is not allowed; e.g., if you specify "fil*.jxy", ***emvu*** does not expand the name to "filter.jxy", but instead ***emvu*** looks for a file with the exact name of "fil*.jxy".

✧ Menu: File - Directory

Select this option to change the default directory where ***emvu*** loads in the ".jxy" files. As part of the menu, the default directory is displayed. To change the default directory, type in the full path to the new directory, like "/home/john" or a relative path, like "..", to the new directory. (The Unix notation ".." means go up one directory level.)

✧ Menu: File - Quit

Use *File* ⇒ *Quit* to exit ***emvu***.

♦ Keyboard Short Cuts

The table below describes the keyboard short cuts available with ***emvu***. These functions may also be implemented by the menu. The short cut keys are "control" keys, abbreviated with a "^" symbol. As an example, to type a control-U (^U), hold down the Control button and press the "U" key.

KEY	MEANING
^D	Move down one level
^U	Move up one level

Also, on many workstations, the "up arrow" and "down arrow" keys function the same as ^U and ^D.

Appendix I The *Emvu* Command Line

Run ***emvu*** by typing "emvu <options> <file-name>". Options may appear after the file name. A file name ending in ".jxy" is recommended.

Most of the usual X Window System command line options are available. For example, to run ***emvu*** on one computer while using the display, keyboard and mouse of another computer (node name, say, "galaxy"), type:

emvu -display galaxy:0

Emvu also looks in all the usual places for the X Window System defaults.

Emvu options are as follows (associated resource keywords are in parentheses):

-background <color> (*background) Sets the background color.

-backing (*backing: yes) Uses backing store, if supported by display. This provides faster re-draw in exchange for larger memory requirements. Unless modified, default is no use of backing store.

-bd <color> (*borderColor) Sets color of main window border.

-bg <color> Same as -background.

-borderwidth <x> (*borderWidth) Sets main window border width to x pixels if allowed by the window manager.

-bordercolor <color>	Same as -bd.
-bw <x>	Same as -borderwidth.
-display <name>	(*display) Sets display for input/output. For example: -display galaxy:0.
-fg <color>	*foreground) Sets color for foreground.
-font <font_name>	(*font) Selects a different font for ***emvu*** displays.
-fn <font_name>	Same as -font.
-foreground <color>	Same as -fg.
-geometry <str>	(*geometry) Sets window size and position. “str” is in the format WIDTHxHEIGHT+XOFF+YOFF, where WIDTH and HEIGHT is the width and height of the ***emvu*** window in pixels. +XOFF places the ***emvu*** window XOFF pixels from the left edge of the screen. If you use -XOFF then the window is offset from the right edge of the screen. +YOFF places the ***emvu*** window from the top edge of the screen and -YOFF places the ***emvu*** window from the bottom edge of the screen.- For example, use “emvu -geometry 800x600-0+0” to make an ***emvu*** window of size 800 by 600 in the top left hand corner of the screen.
-iconic	(*iconic: yes)Starts ***emvu*** up as an icon.
-name <str>	(.name) Used to select a set of special defaults. See X documentation for details.
-noRestoreColorMap	(*noRestoreColorMap: yes) ***Emvu*** loads in Sonnet’s color map (file name of $SONNET_DIR/data/color.pal) upon initialization and unloads the color map every time the mouse leaves the ***emvu*** window. This option prevents the color map from being unloaded when the mouse is moved out of the ***emvu*** window.
-noLoadColorMap	(*noLoadColorMap: yes) Prevents Sonnet’s color map from being loaded in during ***emvu***’s initialization.
-textcolor <color>	(*textColor) Sets color of all text.
-substrateColor <color>	(*substrateColor) Sets background color for the substrate. Color is defined in the form of RRGGBB, where RRGGBB are hexadecimal numbers defining the intensity of red, green and blue. “00” is the lowest intensity and “ff” is the highest. Some examples for settings are: red - “ff0000”, white - “ffffff” and black - “000000”.

-title <str>	(*title) Sets title displayed on main window (if window can display title). Be sure to enclose entire title in quotes if it contains white space.
-xrm <str>	Provides access to the resource manager, see X window documentation.
-Ver	Prints out the current version of ***emvu*** and exits. Must be the first option on the command line. All other options are ignored.
+backing	(*backing: no) Makes sure the backing store is turned off, even if the default has been changed.
+iconic	(*iconic: no) Makes sure window comes up, not icon, even if default has been changed.

There are several ways to specify the defaults to the ***emvu*** program:

1. Command line argument.
2. File specified by $XENVIRONMENT or if not set, the file $HOME/.Xdefaults-<hostname> is used.
3. X11 Default values already set in the window manager or by the xrdb command or, if not set, by the file $HOME/.Xdefaults. Use $HOME/.Xdefaults to set defaults on a per user basis.
4. Reads the file $APPLRESDIR/Emvu
5. Reads the file /usr/lib/X11/app-defaults/Emvu
6. Reads the file $SONNET_DIR/data/Xdefaults. Use this file to set defaults for all ***emvu*** users.

For example the following lines could be added to the $HOME/.Xdefaults file to

```
Emvu*textcolor: blue
Emvu*geometry: 980x680
```

The above file is read by ***emvu*** and sets the origin to the bottom left. Also the ***emvu*** window is started up at 980x680 size (in pixels) For other ways to control the defaults of the X Window System programs, consult the X Window System documentation.

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