

Product Note 35

WinGRAPH, Load Pull Contouring Software for Windows®

WinGRAPH processes CCMT load pull data files to Contour and 3D Surface plots. It handles data files generated by all CCMT software from version 2.0 through 5.0 and WinPOWER, the Windows® version of CCMT's load pull software. WinGRAPH has User selectable "Data Filter" and "Smooth Factor" capability.

Description of WinGRAPH

WinGRAPH is a graphics program that processes load pull data files, generated by the Computer Controlled Tuner system (CCMT) by measuring a number of microwave parameters as a function of source (source pull) or load (load pull) impedance.

The data generated by CCMT are phase- and amplitude-corrected (de-embedded) to the transistor under test reference plane. WinGRAPH handles data in the old format of CCMT software (file extension = .DAT) or the new, MACRO file format (file extension = .LPD).

The .DAT files are binary and contain a maximum of two parameters, in addition to the reflection factor, whereas the .LPD data files are type ASCII, have a variable format and may contain up to 12 parameters for each load (source) impedance. The software then allows to combine two of those parameters and plot their overlapping contours.

The data processing capability of WinGRAPH consists of a contouring routine using the Inverse-Square algorithm and a 3D surfacing routine.

WinGRAPH offers the following features:

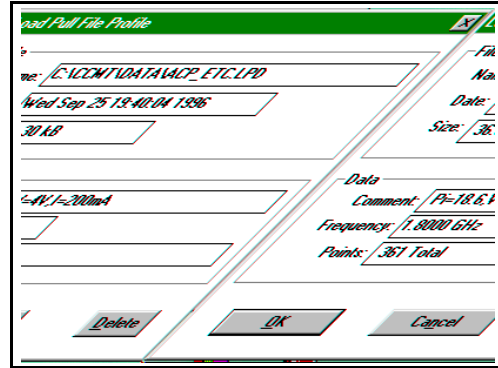
- Select and process any .DAT and .LPD data file.
- Select any combination of two parameters from a .LPD file.
- User defined Contour Title.
- Independent line thickness and colour of each contour.
- Variable Data Filter to eliminate oscillations and irregular data points.
- Display measured Gamma and mark points eliminated by Data Filter.
- Variable Smooth Factor.
- Choice of maximum Gamma to plot.
- Auto and Manual Scaling.
- On line gamma and value reading via mouse pointer.
- Conversion to most popular formats, like Bitmap, GEM, HPGL, PIC, TIFF, PostScript etc..
- Printing using Window's printer drivers and capability.

WinGRAPH operation

WinGRAPH offers a selection of .DAT, .LPD files and the possibility to delete an already loaded file, if it reveals useless, or save it under another name. All this without having to go through the Windows disk Explorer utility.

Once a file is selected its key characteristics are displayed in a dialogue (figure 1).

This dialogue allows to verify the content of the file, the date of creation and the frequency and comment included. At this point the user can decide to proceed with this file or quit and search for another file.



Once the data file has been loaded the main menu offers three options:

File Plot and **Help**. The Plot menu item offers the possibility to enter a title, to select the parameters to plot (in case of a LPD file), to plot a contour, a surface or to configure the contour layout.

The following dialogue boxes illustrate how this is presented:

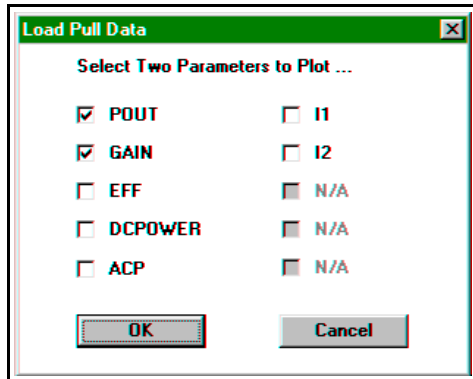


Figure 2 is the parameter configuration dialogue:

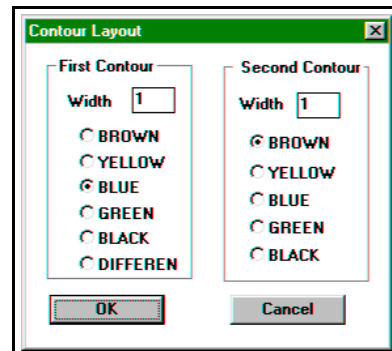
This dialogue can be recalled from the main menu many times and allows to re-configure the contour parameters indefinitely until the desired data are shown superimposed. The data file does not need to be reloaded for this operation.

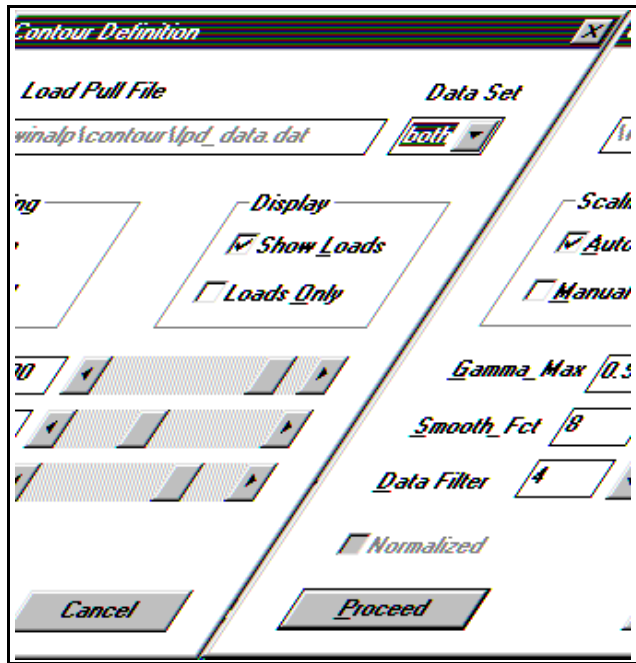
Only two parameters are accepted at the time. Parameters not included in the LPD file are grey shaded.

For example the present LPD file includes the Output Power, Gain, Efficiency, DC Power, Adjacent Channel Power, Input (Base) Current and Output (Collector) Current.

The final layout of both contours can be configured by the user independently. Figure 3 shows the dialogue box that allows to do this.

Both the colour of the lines as well as their thickness can be selected individually from this menu.





The main contour design dialogue is shown on figure 4. The following items can be selected and adjusted by the user:

- 1- Auto or Manual scaling between contours
- 2- Include the measured loads in the plot or show the loads only.
- 3- Adjust the maximum Gamma to be considered in the plot.
- 4- Select the Smooth Factor. Default value is 8. The higher the smooth factor the more accurate but also more jittery will be the contours.
- 5- The Data Filter can be deactivated (=1) or set to any value from 2 to 5. It will eliminate adjacent points which differ more than this factor from the precedent value.
- 6- If the measured has been done with characteristic impedance different that 50 Ohms, the contours can be plotted as such or normalized back to 50 Ohms.

The manual scaling dialogue (figure 5) can be set for the two parameters to be plotted separately. The minimum and maximum value to be plotted as well as the number of contours can be entered. An example of higher resolution contouring is shown on figure 7.

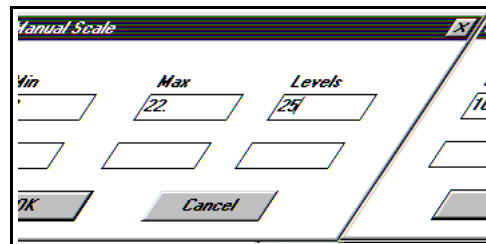


Figure 6 shows a two parameter contour in which the data filter has been activated.

The plot shows overlapping contours of Output Power and Adjacent Channel Power Ratio values, measured at an Input Power of 18.6 dBm. Data points eliminated by the data filter temporarily are marked with solid dots in the Smith Chart. In this particular case the marked dots were all clear, which means the data filter did not eliminate any "fault" data points from the file.

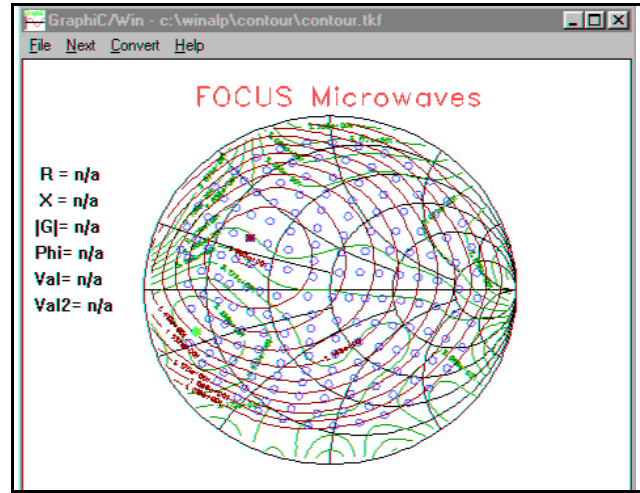


Figure 7 shows a contour plot with manually adjusted scaling to show 30 contour lines.

