



User Manual

ZJ_Matching 1.4.1

ZJ_Matching is an installation-free antenna matching network optimization tool. Just download and unzip the file and run the ZJ_Antenna_Matching.exe. There is another strip down version, ZJ_Matching_Mini, which fits into a 640x480 pixels monitor and can be used on a Windows® based Vector Network Analyzer.

The software can be used to design a matching network for an antenna which can have up to two different scenarios, for example:

- To design a matching network for a whip-stubby antenna which has two positions, extended and retracted positions.
- To design an antenna matching network that gives a balanced performance between the free space and the talking position

To designing a matching network for a cell phone antenna, many commercial software packages, such as Agilent ADS®, Microwave Office® and etc., can be used. When I was working for the industry as an antenna engineer, I did feel although those commercial codes were very powerful, they were not very efficient and were a kind of overkill when be used in an antenna matching network designing, which normally uses less than 4 components. Thus I decided to write this software in my spare time. The first version was written in 2003 and I keep modifying it since then. After I made my career U-turn in 2007, the software can now be released to public.

This is a freeware, so you can use and distribute it as your wish. But I do not take any responsibility for any consequence of using this software.

Have Fun!

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**File lists:**

There are 7 files in the package

COMDLG32.OCX	
help.pdf	Help file
ZJ_Antenna_Matching.exe	Main Program
extended.s1p	Example antenna data file #1
retracted.s1p	Example antenna data file #2
C_value.txt	
L_value.txt	

The values of C_value.txt and L_value.txt files are capacitor and inductor values used in the software. These values are good enough for most application. But both files can to be edited according to capacitors and inductors available to you.

Current Supported data format:

1. TOUCHSTN .S1P
2. TOUCHSTN .S2P (only the first port can be seen)
3. TOUCHSTN .SNP (only the first port can be seen)
4. CITIFILE (only the basic single segment format)

Version History:

1.4.1	01-Sep-2007	First public release
1.0	20-Feb-2003	Initial Version

1. You need to load at least one antenna data file to use the software. Two sample files, `externed.s1p` and `retracted.s1p`, are included in the software package. You can use them for practice.
 - a. When the software starts, only the top 'load file' button is accessible.
 - b. After you load the first file, the second 'load file' button will be accessible. Loading the second data file is optional, load one if you have two scenarios. When you are optimizing an antenna, both antenna scenarios share the same matching network, so you can check out the antenna response at both scenarios at once. When you load two data files, both of them **MUST** have identical frequency span and data points. Otherwise the software will reject the second files.

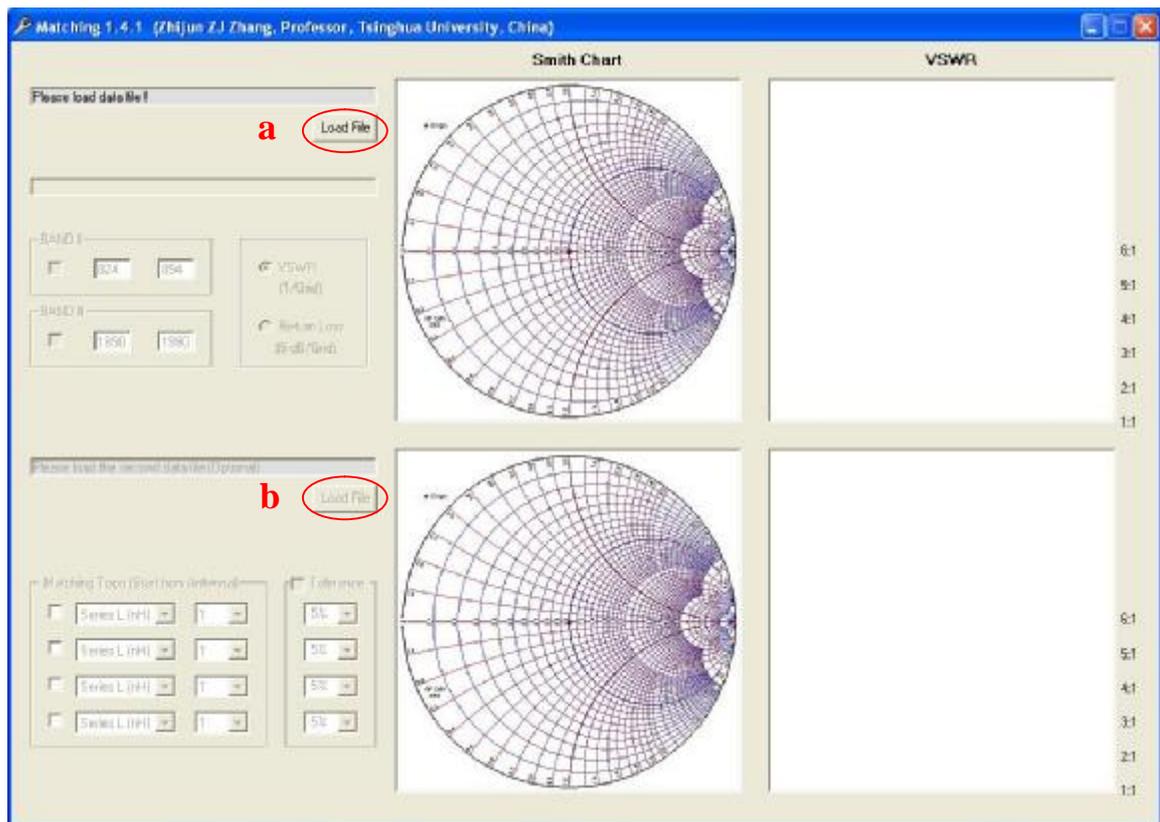


Fig. 1

2. After load a file, the software reports some information. If you can not see the following info, which means the data format is not compatible.
 - a. The software indicates what data format the loaded file is. The software currently only supports TOUCHSTN and CITIFILE formats.
 - b. The software also indicates the minimum frequency and maximum frequency of the loaded file.
 - c. The plot on Smith Chart should be same as what you saw on your Network Analyzer, otherwise it is most likely because you have saved the file as unformatted data which does not includes the port extension you have done. Please read the user manual shipped with your VNA and save the data file as formatted data.
 - d. VSWR or return loss data should also be same as what you saw on your Network Analyzer.

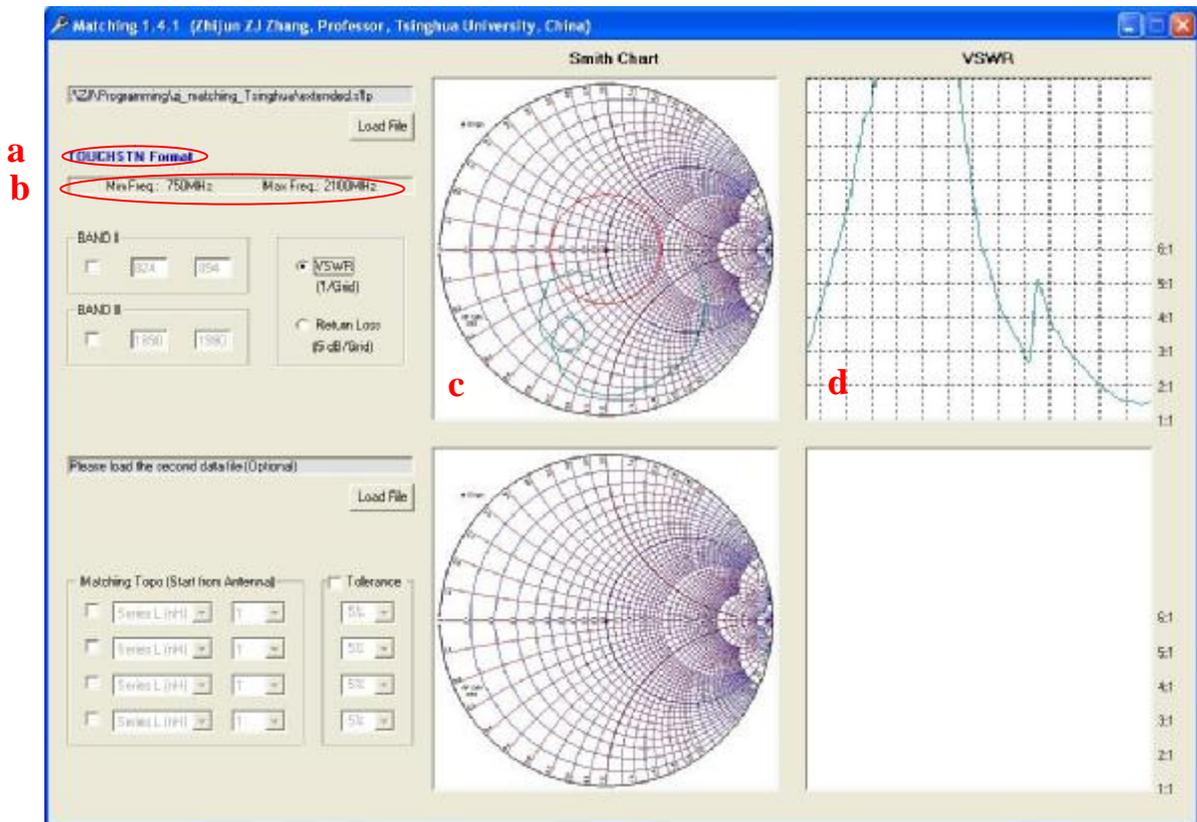


Fig. 2

3. There are some settings you can change.
 - a. You can highlight up to two interested bands. The band-I will be marked by blue color on both Smith Chart and VSWR/Return Loss plots. The band-II will be marked by green color.
 - b. You can switch display format between VSWR and Return Loss.
 - c. The red circle in Smith Chart is VSWR 2:1 circle.
 - d. In VSWR/Return Loss plot, the grid is 100MHz each grid along X-axis. Along Y-axis, the unit of VSWR plot is 1/grid and that of Return Loss plot is 5dB/grid

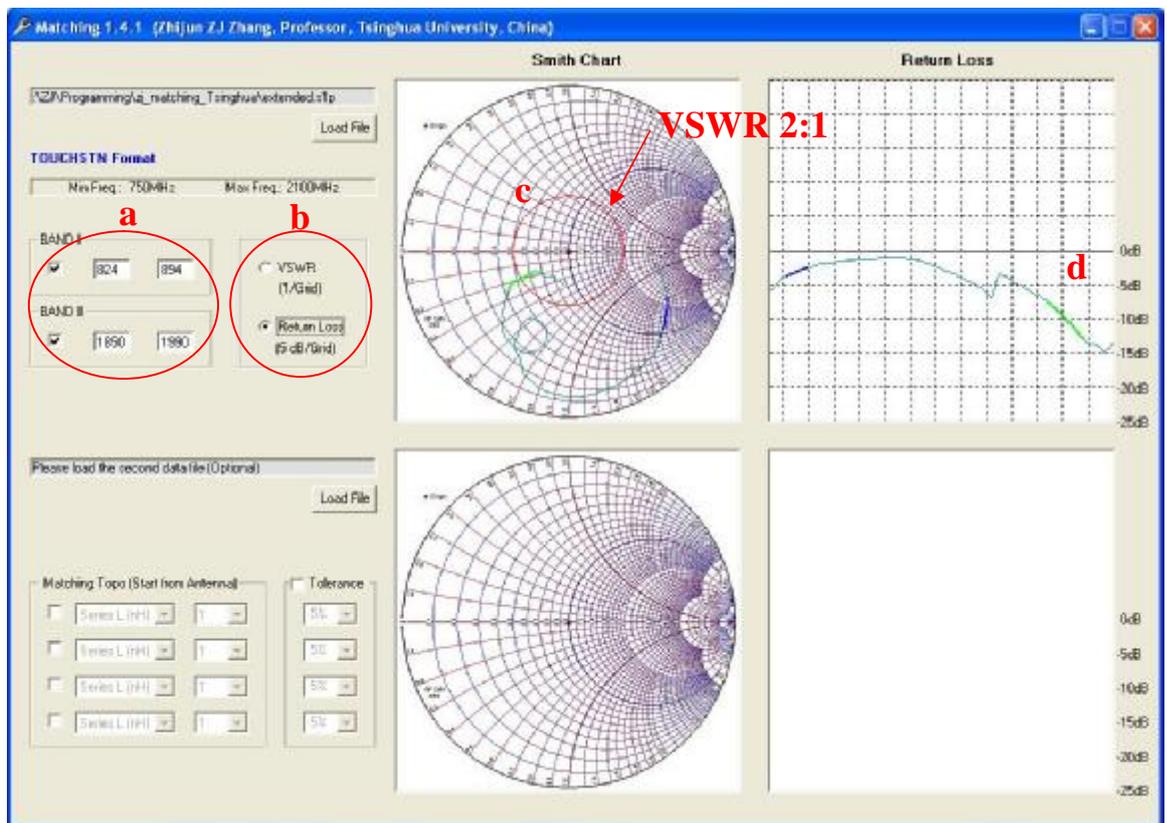


Fig. 3

4. You can modify the matching network to simulate the response in Smith Chart, VSWR or Return Loss format.
 - a. If looking from antenna side, the top one is the first component. You can add up to four matching components. Each component can be series inductor (Serial L), shunt inductor (Shunt L), series capacitor (Serial C) or shunt capacitor (Shunt C). The unit for capacitor is pF and for inductor is nH.
 - b. You can use pull down menu to adjust matching component value. If you can not find the value you need, please modify C_value.txt and L_value.txt files according to capacitors and inductors available to you. Please restart the software to valid modification.
 - c. The black line inside graphic area is the original antenna response without the matching network. The blue line is the response of the matched antenna.

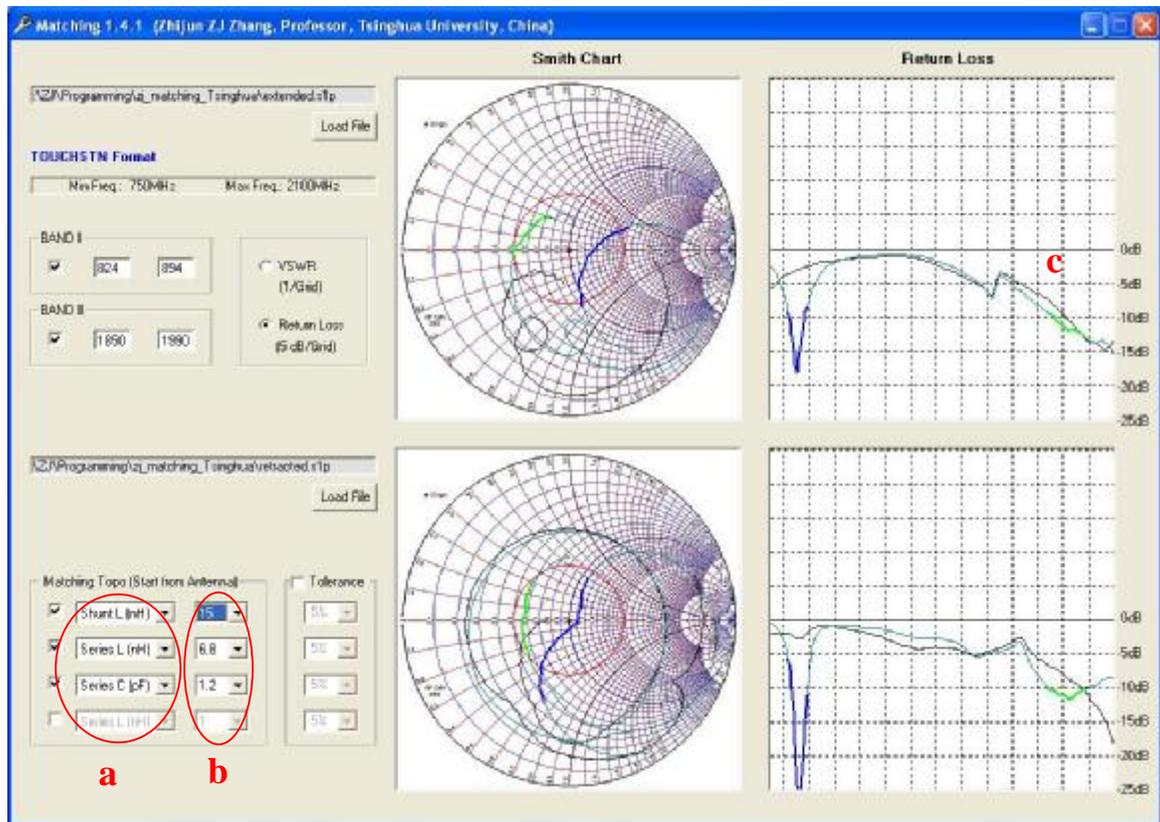


Fig. 4

5. The software also supports tolerance analysis. Either BAND I or II has to be selected before tolerance analysis can be done.
- The tolerance analysis shows the worst case that might happen.
- You can use pull down menu to adjust component tolerance from 0% to 20%.
 - The tolerance result is only shown in VSWR or Return Loss plots.

