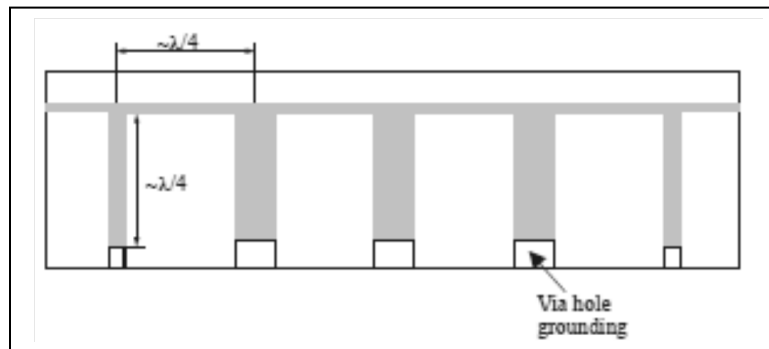# Quick Start User Manual: WBfilter

1.0   Getting Ready:

The software product you purchased is located inside a ZIP file that you can open, by following these steps:

1. Double-click on the ZIP file you purchased. This action starts the ZIP Wizard application, which contains the software product.
2. The ZIP Wizard automatically opens the software product you purchased and stores it inside your computer.
3. Once the software product is unzipped, right-click on the application's *filename* and single-click: "Extract". This action will extract all files located inside the software product and store them inside your computer:
    a. *WBfilter.exe*: The executable software product.
    b. *WBfilter.DEF*: Default Data File read by *WBfilter.exe*
    c. *Quick Start User Manual*: This User Manual.
    d. *License*: License Agreement for the software product.
4. NOTE: All files unzipped inside your computer must be located in the same file folder, since several Data Files are read by the executable software product.
5. Open the License Agreement so you know the terms & conditions for using the software product. Return the software product for a full refund if you do not agree with those terms & conditions, as stated in the License Agreement.
6. Open the Default Data File: *WBfilter.DEF* using Notepad and read the description contained inside.

Once the above software files are extracted and stored inside your computer, just double-click on the executable file to start using the product.

2.0   How I Works:

Software product: *WBfilter.exe* performs Electrical Synthesis, Dimensional Synthesis and Frequency Analysis of Bandpass Filters with wide operating passbands, when constructed in microstrip or stripline medium. That is: Wideband Bandpass Filters. These Wideband Bandpass Filters are realized as Quarter-wavelength short-circuited stubs located between Quarter-wavelength inter-connecting transmission lines. This software product synthesizes the electrical circuit and physical dimensions for those short-circuited stubs & inter-connecting lines.

The executable file: *WBfilter.exe* reads the Default Data File: *WBfilter.DEF* each time you start the program. As such, you can change Data Entries inside *WBfilter.DEF* to suite your most common Wideband Bandpass Filter designs, using the guidelines written in *WBfilter.DEF*.

When you start using the software product, you are asked to enter key design parameters for your Wideband Bandpass Filter. If you press <ENTER> on your computer's keyboard, the software product uses the Data Entry from your Default Data File: *WBfilter.DEF* for that design parameter. As such, you can change any/all Data Entries in *WBfilter.DEF* to suite your most common Wideband Bandpass Filter designs, without having to enter those values when asked by the executable file: *WBfilter.exe*. Just press <ENTER> on your computer's keyboard and your Default Data values are used for that Data entry by the software product.

Figure 2-1 shows the baseline data entries for Default Data file: WBfilter.DEF.

Certain design parameters have a "default answer", shown as an asterisk (*), which enables you to press <ENTER> on your keyboard, if that "default answer" (= *) is your selection.

Lastly, all Data entries (including Default Data entries) are included in the Output Data format so you know the basis for the Electrical & Dimensional Synthesis and for the Frequency Analysis of your Wideband Bandpass Filters.

Most data entries are straight-forward and easy to understand for those skill-at-the-art of RF/microwave design.......and those not-so-skilled. So, let us know where improvements are needed as you operate the software product.

3.0   Screen Shots: Input Data

Screen-shots for User Input Data entry are shown in Figures 3-1 and Figure 3- 2 for Electrical & Dimensional Synthesis of your Wideband Bandpass Filters, respectively.

4.0   Screen Shots: Output Data

Screen-shots of Output Data calculated by the software product are shown in Figures 4-1 and Figure 4-2 for Electrical & Dimensional Synthesis of your Wideband Bandpass Filters, respectively.

The Output Data from the software product can be stored in a User-defined filename:
  A. Enter a *filename*.**xls** for storage in a spreadsheet.
  B. Enter *filename*.**doc** for Output Data storage in a word processor.
  C. Enter *filename*.**txt** for Output Data storage as a text file.

The Output Data files can be used for presentations to your Customers, e-mails to your colleagues, and for graphical plots of your Output Data.

5.0   User Data Files:

For the Analysis Option, the software product reads a User's Input Data filename to analyze the Frequency response of physical dimensions for your Wideband Bandpass Filter planned for manufacture, prior to fabrication.

You can create any number of User Input Data files, each of which defines the actual physical dimensions of your Wideband Bandpass Filters. Once created, you can enter that Input Data filename when asked by the software product, for Frequency Analysis and for comparison with actual measured data for that design.

6.0 Software Bugs

Every effort has been applied to minimize "software bugs" inside the software product. Yet, we invite all Users to notify us if you find one. Many thanks!

Inside the software product, you will find "User-friendly Error Traps", which identify errors in your Data Entry. The software product notifies you when an error is detected and asks for a different Data Entry, so the software product performs within the proper technical bounds for the technology.

7.0 Customer Satisfaction:

Many thanks for purchasing our RF/microwave CAE software product. We hope you find the product useful in your high frequency designs, both in Synthesis of your designs and in Analysis of your designs. Please let us know where our software product can be improved, and what your needs are for another software product you could use. . . . .. perhaps we can develop that software product for you.

Our best regards. . . . .

AtlantaRF

Short-circuited stub
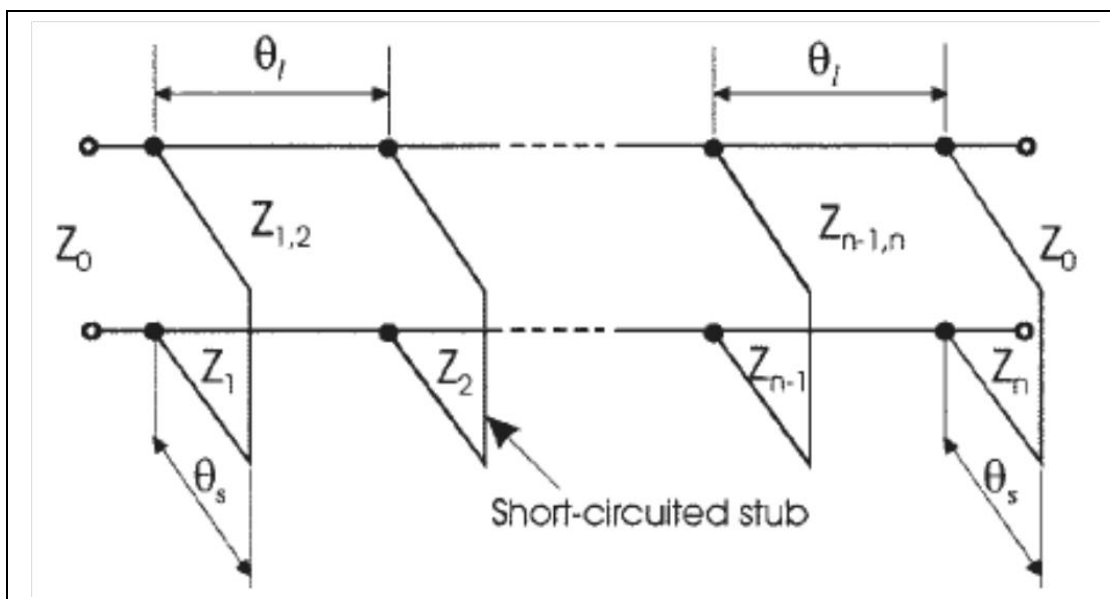
```
WBfilter.DEF contains all Default Data values read by Program; WBfilter.exe
10000.0          :Fo      = Filter's Center Frequency.............................MHz
 4000.0          :BW      = Filter's Passband Bandwidth…………..……....MHz
   1.0           :TORB   = 1.0 for Tchebyschev; =2.0 for Butterworth
   0.05          :RIPPLE= Passband Amplitude Ripple………………....dB
 6000.0          :F1      = Out-of-band Skirt Freq where A1 is needed…MHz
   50.0          :A1      = Minimum Attenuation needed at Skirt Freq….dB
   9.0           :N       = Number of Sections/Poles in the Filter
   50.0          :Zo      = Impedance level of the System……………....Ohms
   1.0           :MSorSL= 1.0 for Microstrip; = 2.0 for Stripline
   0.025         :H       = Microstrip`s Substrate Height: H……….…....Inches
   9.6           :ERm    = Micrsostrip`s Relative Dielectric Constant
   0.0005        :Tm      = Microstrip`s Conductor Strip Thickness….......Inches
   0.125         :B       = Stripline`s Ground Plane Thickness: B….…....Inches
   2.3           :ERs     = Stripline`s Relative Dielectric Constant
   0.0014        :Ts      = Stripline`s Conductor Strip Thickness…….….Inches
WBfilterE.DAT    :FNE    = Default filename for your Electrical Data Storage
WBfilterD.DAT    :FND    = Default filename for your Dimensional Data Storage
                  |
                  |____ The first 20 characters are read by WBfilter.exe
```

Default Data File: WBfilter.DEF is read by RF/microwave software product:
WBfilter.exe when you start the program. As such, the executable file
(WBfilter.exe) and this Default Data File (WBfilter.DEF) must be located
in the same Folder or Subfolder in your computer.

The executable program (WBfilter.exe) reads the first 20 characters in each
line from WBfilter.DEF, so keep those first 20 characters for data, and do
not shorten any line in this Default Data File: WBfilter.DEF.

The User is invited to change any/all data values in WBfilter.DEF to data
values that you commonly use for your RF/microwave designs of Wideband
Bandpass Filters realized with Short-Circuited Quarter-wavelength stubs
separated by Quarter-wavelength Connecting Transmission Lines, so you do
not have to enter data values when prompted by WBfilter.exe (just press
ENTER on your computer's keyboard and your Default Data values will be
assigned to that data entry).

Thank you for choosing Atlanta RF for your RF/microwave CAE software products.

Figure 2-1: Baseline data entries (and Instructions) in **Default Data file**: WBfilter.DEF

Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
RF/Microwave Computer-Aided Engineering Software.
Program: WBfilter (v. 1.0)   Date:10/16/2012 at 14:32: 0Hours

This program performs Electrical SYNTHESIS, Dimensional SYNTHESIS and
Frequency ANALYSIS of Wideband Bandpass Filters which are realized by
Quarter-wavelength Short-Circuit Stubs separated by Quarter-Wavelength
Connecting Lines, exhibiting a Tchebyscheff or Butterworth response across
its passband frequencies, with construction in Microstrip or Stripline.

Please enter the following Design Data:
   -Filter`s Center Frequency,   MHz = **10000.0**
   -Filter`s Passband Bandwidth,MHz = **4000.0**
   -Desired Bandwidth for Filter   =   40.00 %
   -Select RESPONSE Profile for the Filter:
    *1: Tchebyscheff (Equi-ripple) Passband Response.
    2: Butterworth (Maximally Flat) Passband Response.
     RESPONSE Profile selected = **1**

   -Enter Passband RIPPLE Level in dB:
    - Enter 0.01 for VSWR = 1.10:1
    -*Enter 0.05 for VSWR = 1.24:1
    - Or a value of your choice.
    Desired Passband Ripple Level = **0.05**
   -Select METHOD for entering Number of Cavities:
    *1: User enters Number of Cavities, N
    2: User enters Attenuation at Skirt Frequency
        METHOD selected = **1**
  -Number of Sections/Poles, N   = **9**
  -Impedance of the System, Ohms = **50.0**

  Is Output Data STORAGE desired? (1=Yes) = **1**
  Enter a FILENAME (up to 20 characters) for Output Data storage:
   -Enter: Filename.xls for storage in a spreadsheet
   -Enter: Filename.doc for storage in a word processor
   -Enter: Filename.txt for storage as a text document
   Enter your FILENAME for Output Data Storage: **WBfilter-SYN.DAT**

> User Data
> Entries are
> shown in
> **RED text**

Figure 3-1: Typical Input Data entry for **Electrical Synthesis** in WBfilter.exe

SYNTHESIS of the Distributed Electrical Circuit for your Filter completed.
Select the next OPERATION:
    1. Synthesize Physical DIMENSIONS for your Bandpass Filter.
    2. Design a NEW Wideband Bandpass Filter.
   *3. EXIT to operating system.
OPERATION selected = **1**

Please enter the following Dimensional Data:
  *1: Microstrip Filter, or
   2: Stripline Filter
    Filter TYPE selected = **1**
-Microstrip`s Dielectric Thickness   (H), Inches = **0.025**
-Substrate`s Relative Dielectric Constant (Er)   = **9.6**
-Center Conductor`s Strip Thickness(T), Inches = **0.0005**

Is Output Data STORAGE desired? (1=Yes) = **1**
Enter a FILENAME (up to 20 characters) for Output Data storage:
  -Enter: Filename.xls for storage in a spreadsheet
  -Enter: Filename.doc for storage in a word processor
  -Enter: Filename.txt for storage as a text document
  Enter your FILENAME for Output Data Storage: **WBfilter-D.DAT**

> User Data Entries are shown in **RED text**

Figure 3-2: Typical Input Data entry for **Dimensional Synthesis** in WBfilter.exe

```
---------------------------------------------------------------------------------------------
 WBfilter (v. 1.0)                          Date:10/16/2012 at 14:32: 0Hours
            Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
            RF/Microwave Computer-Aided Engineering Design Data For
                       Wideband Bandpass Filters.

   SYNTHESIS of the Distributed Electrical Circuit for your Wideband
   Bandpass Filter results in the following design data:

    Flow  =  8000.000 MHz       Response   = Tchebyscheff
    Fo    = 10000.000 MHz        # of Poles   = 9
    Fhigh= 12000.000 MHz         Ripple (Am) = 0.050 dB
    BW   =  4000.000 MHz        Zo of System=  50.00 Ohms

    Impedance of One   Impedance of Two      Impedance of Inter-
    Shorted Stub,Ohms  Shorted Stubs,Ohms     Connecting Lines
 Stub Matthaei  Cristal  Matthaei  Cristal  Line   Matthaei   Cristal
  K    Z(K)     Z(K)     Z(K)      Z(K)     K,K+1  Z(K,K+1)  (Z(K,K+1)
---------------------------------------------------------------------------------------------
  1    22.245   20.454   44.489    40.907    1 2    41.707    63.548
  2    11.167   28.811   22.333    57.623    2 3    40.770    90.017
  3    11.083   24.967   22.165    49.934    3 4    43.584    96.230
  4    10.921   24.408   21.843    48.817    4 5    44.436    98.112
  5    10.886   24.290   21.773    48.580    5 6    44.436    98.112
  6    10.921   24.408   21.843    48.817    6 7    43.584    96.230
  7    11.083   24.967   22.165    49.934    7 8    40.770    90.017
  8    11.167   28.811   22.333    57.623    8 9    41.707    63.548
  9    22.245   20.454   44.489    40.907
---------------------------------------------------------------------------------------------
    Output Data stored in User filename: WBfilter-SYN.DAT
```

Figure 4-1: Typical Output Data for **Electrical Synthesis** from WBfilter.exe

```
-------------------------------------------------------------------------------------------
 WBfilter (v. 1.0)                           Date:10/16/2012 at 14:32: 0Hours
                  Copyright 2012 Atlanta RF Software (www.AtlantaRF.com)
                  RF/Microwave Computer-Aided Engineering Design Data For
                              Wideband Bandpass Filters.

   SYNTHESIS of physical DIMENSIONS from the Distributed Electrical
   Circuit for your Wideband Bandpass Filter results in the following
   design data:

       Response = Tchebyscheff        Ripple = 0.050 dB
       H  = 0.0250 "               Construction = Microstrip
       T = 0.0005 "               # of Sections= 9
       Er = 9.600                  Center Freq. = 10000.000 MHz
       Zo =  50.00 Ohms           Bandwidth   = 4000.000 MHz

 Two Short-Circuited Stubs, Inches  *        Inter-Connecting Lines, Inches
 Stub Per Matthaei      Per Cristal  * Line     Per Matthaei     Per Cristal
 K    Width Length    Width Length * K,K+1  Width  Length Width  Length
 -------------------------------------------------------------------------------------------
 1   0.0308 0.1123 0.0361 0.1113 *  1, 2   0.0348 0.1115 0.0138 0.1167
 2   0.0938 0.1047 0.0177 0.1155 *  2, 3   0.0363 0.1112 0.0044 0.1208
 3   0.0948 0.1046 0.0244 0.1138 *  3, 4   0.0321 0.1120 0.0033 0.1215
 4   0.0968 0.1044 0.0256 0.1135 *  4, 5   0.0309 0.1123 0.0030 0.1217
 5   0.0972 0.1044 0.0259 0.1134 *  5, 6   0.0309 0.1123 0.0030 0.1217
 6   0.0968 0.1044 0.0256 0.1135 *  6, 7   0.0321 0.1120 0.0033 0.1215
 7   0.0948 0.1046 0.0244 0.1138 *  7, 8   0.0363 0.1112 0.0044 0.1208
 8   0.0938 0.1047 0.0177 0.1155 *  8, 9   0.0348 0.1115 0.0138 0.1167
 9   0.0308 0.1123 0.0361 0.1113 *

 For a Zo =  50.00 Ohms, Line Width =  0.0243 Inches.

 CAUTION: T-Junction effects are not included in the physical realization.
 -------------------------------------------------------------------------------------------
     Output Data stored in User filename: WBfilter-D.DAT
```
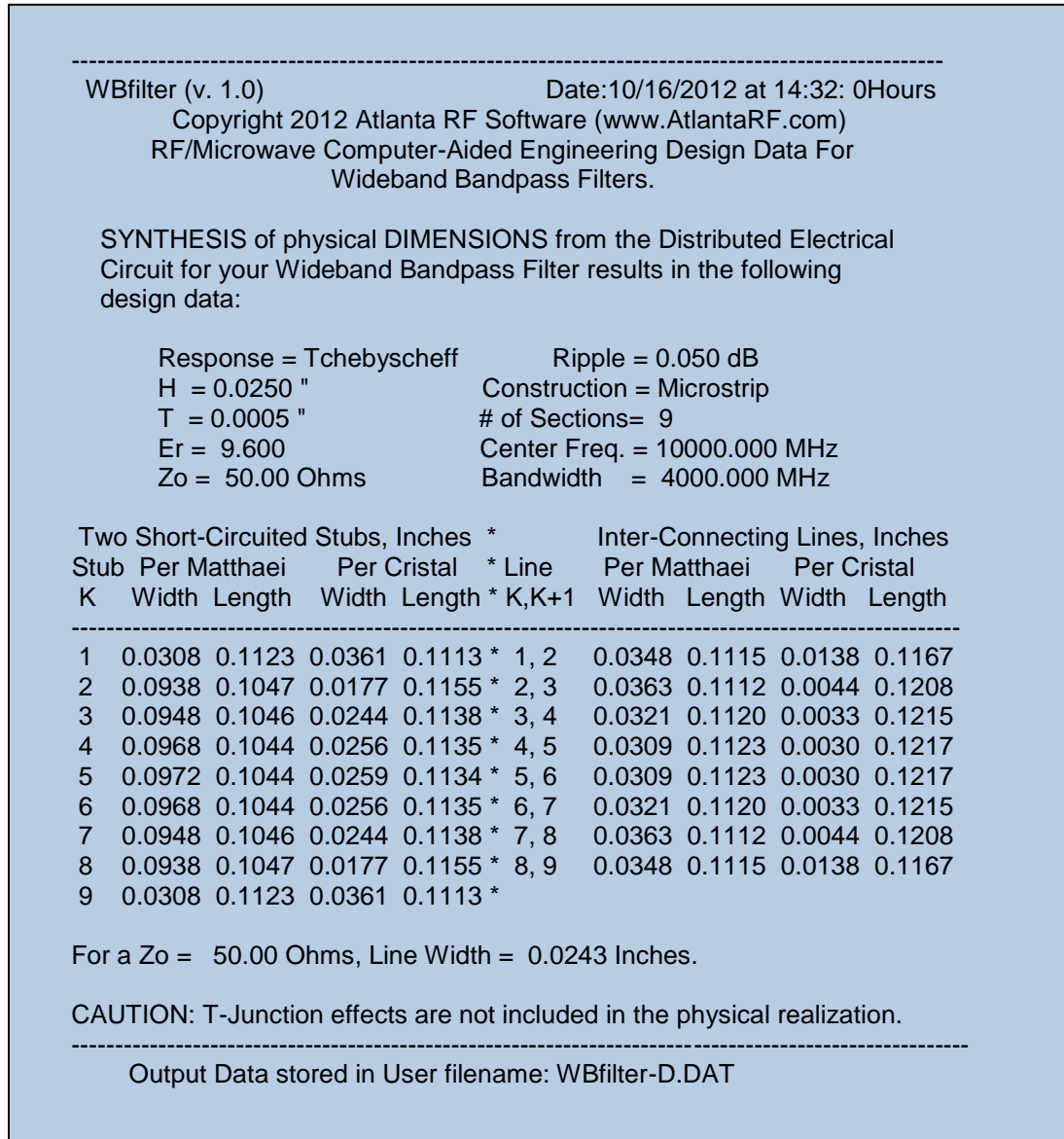
Figure 4-2: Typical Output Data for **Dimensional Synthesis** from WBfilter.exe