



February 2011
CDMA2000 DesignGuide

© **Agilent Technologies, Inc. 2000-2011**

5301 Stevens Creek Blvd., Santa Clara, CA 95052 USA

No part of this documentation may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Agilent Technologies, Inc. as governed by United States and international copyright laws.

Acknowledgments

Mentor Graphics is a trademark of Mentor Graphics Corporation in the U.S. and other countries. Mentor products and processes are registered trademarks of Mentor Graphics Corporation. * Calibre is a trademark of Mentor Graphics Corporation in the US and other countries. "Microsoft®, Windows®, MS Windows®, Windows NT®, Windows 2000® and Windows Internet Explorer® are U.S. registered trademarks of Microsoft Corporation. Pentium® is a U.S. registered trademark of Intel Corporation. PostScript® and Acrobat® are trademarks of Adobe Systems Incorporated. UNIX® is a registered trademark of the Open Group. Oracle and Java and registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners. SystemC® is a registered trademark of Open SystemC Initiative, Inc. in the United States and other countries and is used with permission. MATLAB® is a U.S. registered trademark of The Math Works, Inc.. HiSIM2 source code, and all copyrights, trade secrets or other intellectual property rights in and to the source code in its entirety, is owned by Hiroshima University and STARC. FLEXIm is a trademark of Globetrotter Software, Incorporated. Layout Boolean Engine by Klaas Holwerda, v1.7 <http://www.xs4all.nl/~kholwerd/bool.html> . FreeType Project, Copyright (c) 1996-1999 by David Turner, Robert Wilhelm, and Werner Lemberg. QuestAgent search engine (c) 2000-2002, JObjects. Motif is a trademark of the Open Software Foundation. Netscape is a trademark of Netscape Communications Corporation. Netscape Portable Runtime (NSPR), Copyright (c) 1998-2003 The Mozilla Organization. A copy of the Mozilla Public License is at <http://www.mozilla.org/MPL/> . FFTW, The Fastest Fourier Transform in the West, Copyright (c) 1997-1999 Massachusetts Institute of Technology. All rights reserved.

The following third-party libraries are used by the NlogN Momentum solver:

"This program includes Metis 4.0, Copyright © 1998, Regents of the University of Minnesota", <http://www.cs.umn.edu/~metis> , METIS was written by George Karypis (karypis@cs.umn.edu).

Intel@ Math Kernel Library, <http://www.intel.com/software/products/mkl>

SuperLU_MT version 2.0 - Copyright © 2003, The Regents of the University of California, through Lawrence Berkeley National Laboratory (subject to receipt of any required approvals from U.S. Dept. of Energy). All rights reserved. SuperLU Disclaimer: THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF

SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

7-zip - 7-Zip Copyright: Copyright (C) 1999-2009 Igor Pavlov. Licenses for files are: 7z.dll: GNU LGPL + unRAR restriction, All other files: GNU LGPL. 7-zip License: This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA. unRAR copyright: The decompression engine for RAR archives was developed using source code of unRAR program. All copyrights to original unRAR code are owned by Alexander Roshal. unRAR License: The unRAR sources cannot be used to re-create the RAR compression algorithm, which is proprietary. Distribution of modified unRAR sources in separate form or as a part of other software is permitted, provided that it is clearly stated in the documentation and source comments that the code may not be used to develop a RAR (WinRAR) compatible archiver. 7-zip Availability: <http://www.7-zip.org/>

AMD Version 2.2 - AMD Notice: The AMD code was modified. Used by permission. AMD copyright: AMD Version 2.2, Copyright © 2007 by Timothy A. Davis, Patrick R. Amestoy, and Iain S. Duff. All Rights Reserved. AMD License: Your use or distribution of AMD or any modified version of AMD implies that you agree to this License. This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA Permission is hereby granted to use or copy this program under the terms of the GNU LGPL, provided that the Copyright, this License, and the Availability of the original version is retained on all copies. User documentation of any code that uses this code or any modified version of this code must cite the Copyright, this License, the Availability note, and "Used by permission." Permission to modify the code and to distribute modified code is granted, provided the Copyright, this License, and the Availability note are retained, and a notice that the code was modified is included. AMD Availability: <http://www.cise.ufl.edu/research/sparse/amd>

UMFPACK 5.0.2 - UMFPACK Notice: The UMFPACK code was modified. Used by permission. UMFPACK Copyright: UMFPACK Copyright © 1995-2006 by Timothy A. Davis. All Rights Reserved. UMFPACK License: Your use or distribution of UMFPACK or any modified version of UMFPACK implies that you agree to this License. This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License

as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA Permission is hereby granted to use or copy this program under the terms of the GNU LGPL, provided that the Copyright, this License, and the Availability of the original version is retained on all copies. User documentation of any code that uses this code or any modified version of this code must cite the Copyright, this License, the Availability note, and "Used by permission." Permission to modify the code and to distribute modified code is granted, provided the Copyright, this License, and the Availability note are retained, and a notice that the code was modified is included. UMFPACK Availability: <http://www.cise.ufl.edu/research/sparse/umfpack> UMFPACK (including versions 2.2.1 and earlier, in FORTRAN) is available at <http://www.cise.ufl.edu/research/sparse> . MA38 is available in the Harwell Subroutine Library. This version of UMFPACK includes a modified form of COLAMD Version 2.0, originally released on Jan. 31, 2000, also available at <http://www.cise.ufl.edu/research/sparse> . COLAMD V2.0 is also incorporated as a built-in function in MATLAB version 6.1, by The MathWorks, Inc. <http://www.mathworks.com> . COLAMD V1.0 appears as a column-preordering in SuperLU (SuperLU is available at <http://www.netlib.org>). UMFPACK v4.0 is a built-in routine in MATLAB 6.5. UMFPACK v4.3 is a built-in routine in MATLAB 7.1.

Qt Version 4.6.3 - Qt Notice: The Qt code was modified. Used by permission. Qt copyright: Qt Version 4.6.3, Copyright (c) 2010 by Nokia Corporation. All Rights Reserved. Qt License: Your use or distribution of Qt or any modified version of Qt implies that you agree to this License. This library is free software; you can redistribute it and/or modify it under the

terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version. This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details. You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA Permission is hereby granted to use or copy this program under the terms of the GNU LGPL, provided that the Copyright, this License, and the Availability of the original version is retained on all copies. User

documentation of any code that uses this code or any modified version of this code must cite the Copyright, this License, the Availability note, and "Used by permission." Permission to modify the code and to distribute modified code is granted, provided the Copyright, this License, and the Availability note are retained, and a notice that the code was modified is included. Qt Availability: <http://www.qtsoftware.com/downloads> Patches Applied to Qt can be found in the installation at:

\$HPEESOF_DIR/prod/licenses/thirdparty/qt/patches. You may also contact Brian Buchanan at Agilent Inc. at brian_buchanan@agilent.com for more information.

The HiSIM_HV source code, and all copyrights, trade secrets or other intellectual property rights in and to the source code, is owned by Hiroshima University and/or STARC.

Errata The ADS product may contain references to "HP" or "HPEESOF" such as in file names and directory names. The business entity formerly known as "HP EEsof" is now part of Agilent Technologies and is known as "Agilent EEsof". To avoid broken functionality and to maintain backward compatibility for our customers, we did not change all the names and labels that contain "HP" or "HPEESOF" references.

Warranty The material contained in this document is provided "as is", and is subject to being changed, without notice, in future editions. Further, to the maximum extent permitted by applicable law, Agilent disclaims all warranties, either express or implied, with regard to this documentation and any information contained herein, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Agilent shall not be liable for errors or for incidental or consequential damages in connection with the furnishing, use, or performance of this document or of any information contained herein. Should Agilent and the user have a separate written agreement with warranty terms covering the material in this document that conflict with these terms, the warranty terms in the separate agreement shall control.

Technology Licenses The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license. Portions of this product include the SystemC software licensed under Open Source terms, which are available for download at <http://systemc.org/>. This software is redistributed by Agilent. The Contributors of the SystemC software provide this software "as is" and offer no warranty of any kind, express or implied, including without limitation warranties or conditions or title and non-infringement, and implied warranties or conditions merchantability and fitness for a particular purpose. Contributors shall not be liable for any damages of any kind including without limitation direct, indirect, special, incidental and consequential damages, such as lost profits. Any provisions that differ from this disclaimer are offered by Agilent only.

Restricted Rights Legend U.S. Government Restricted Rights. Software and technical data rights granted to the federal government include only those rights customarily provided to end user customers. Agilent provides this customary commercial license in Software and technical data pursuant to FAR 12.211 (Technical Data) and 12.212 (Computer Software) and, for the Department of Defense, DFARS 252.227-7015 (Technical Data - Commercial Items) and DFARS 227.7202-3 (Rights in Commercial Computer Software or Computer Software Documentation).

CDMA2000-Compliant Signal Source DesignGuide Reference	7
Using DesignGuides	7
Basic Procedure	8
Available Signal Sources	11

CDMA2000-Compliant Signal Source DesignGuide Reference

The CDMA-2000-Compliant Signal Source DesignGuide provides a selection of pre-formatted signal sources for the CDMA2000-compliant Design Library for Advanced Design System. These signal sources provide various combinations of link direction, spreading rate, radio configuration and number of users. Note that these are *partially coded* sources, suitable for use in CDMA2000 system simulations such as transmitter power amplifier evaluation and link propagation studies.

The available configurations are similar to the Agilent ESG-D RF Signal Generator with Option 101. However, although they do include higher levels of coding, they are not fully-coded signals. In addition, the CDMA2000-compliant Design Library filters are based upon the IS-2000 specification, while the ESG-D filters default to a modified and equalized filter optimized for ACPR performance. Therefore, some differences in the resulting signal statistics are to be expected when compared to the ESG-D performance.

Note

This document is written describing and showing access through the cascading menu preference. If you are running the program through the selection dialog box method, the appearance and interface will be slightly different.

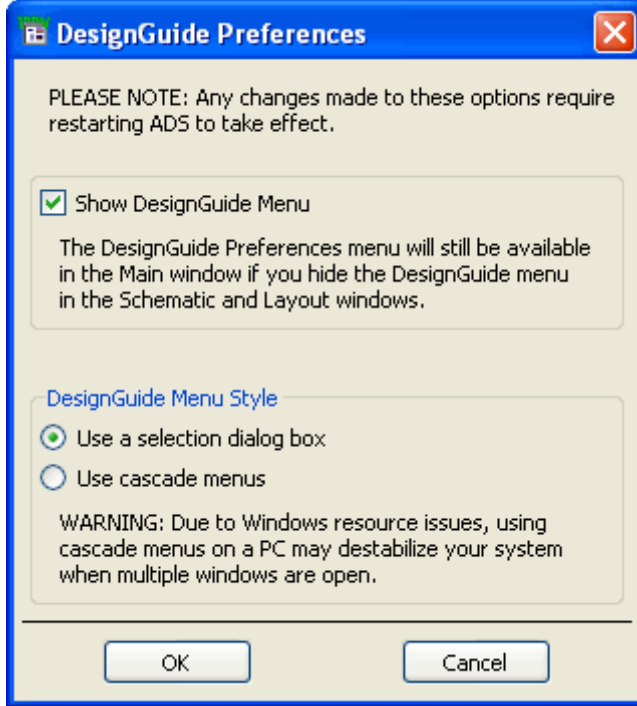
Using DesignGuides

All DesignGuides can be accessed from the *Schematic* window through either cascading menus or dialog boxes. You can configure your preferred method in the ADS Main window. Select the *DesignGuide* menu.

The commands in this menu are as follows:

- **DesignGuide Developer Studio > Developer Studio Documentation** is only available on this menu if you have installed the DesignGuide Developer Studio. It brings up the DesignGuide Developer Studio documentation. Another way to access the Developer Studio documentation is by selecting *Help > Topics and Index > DesignGuides > DesignGuide Developer Studio* (from any ADS program window).
- **DesignGuide Developer Studio > Start DesignGuide Studio** is only available on this menu if you have installed the DesignGuide Developer Studio. It launches the initial Developer Studio dialog box.
- **Add DesignGuide** brings up a directory browser in which you can add a DesignGuide to your installation. This is primarily intended for use with DesignGuides that are custom-built through the Developer Studio.
- **List/Remove DesignGuide** brings up a list of your installed DesignGuides. Select any that you would like to uninstall and choose the *Remove* button.

- **Preferences** brings up a dialog box that allows you to:
 - Disable the DesignGuide menu commands (all except Preferences) in the Main window by unchecking this box. In the Schematic and Layout windows, the complete DesignGuide menu and all of its commands will be removed if this box is unchecked.
 - Select your preferred interface method (cascading menus vs. dialog boxes).



Close and restart the program for your preference changes to take effect.

Note
On PC systems, Windows resource issues might limit the use of cascading menus. When multiple windows are open, your system could become destabilized. Thus the dialog box menu style might be best for these situations.

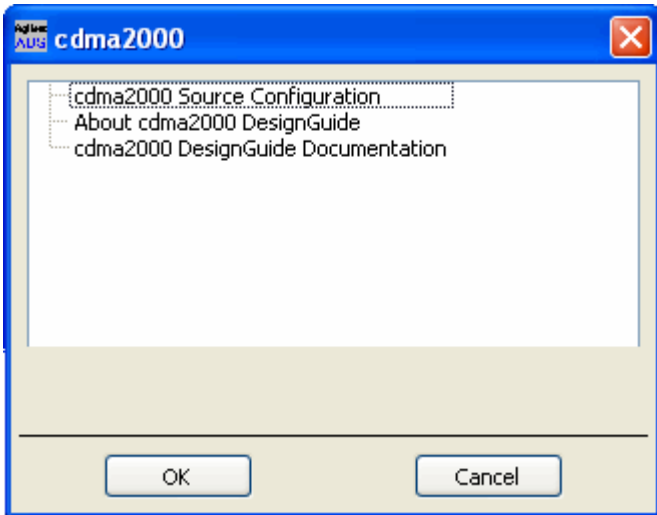
Accessing the Documentation

To access the documentation for the DesignGuide, select either of the following:

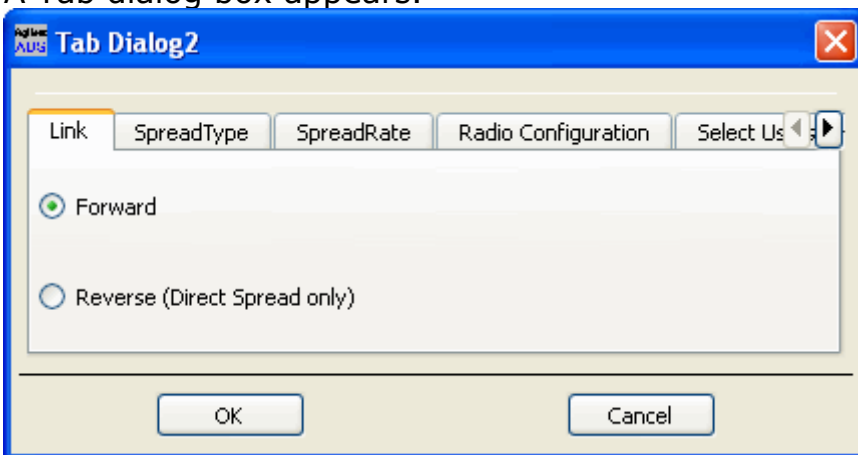
- **DesignGuide > cdma2000 > cdma2000 DesignGuide Documentation** (from ADS Schematic window)
- **Help > Topics and Index > DesignGuides > cdma2000** (from any ADS program window)

Basic Procedure

From the DesignGuide menu on a Schematic window (which should be in *DSP* mode), select **cdma2000 > cdma2000 Source Configuration**.



A Tab dialog box appears.



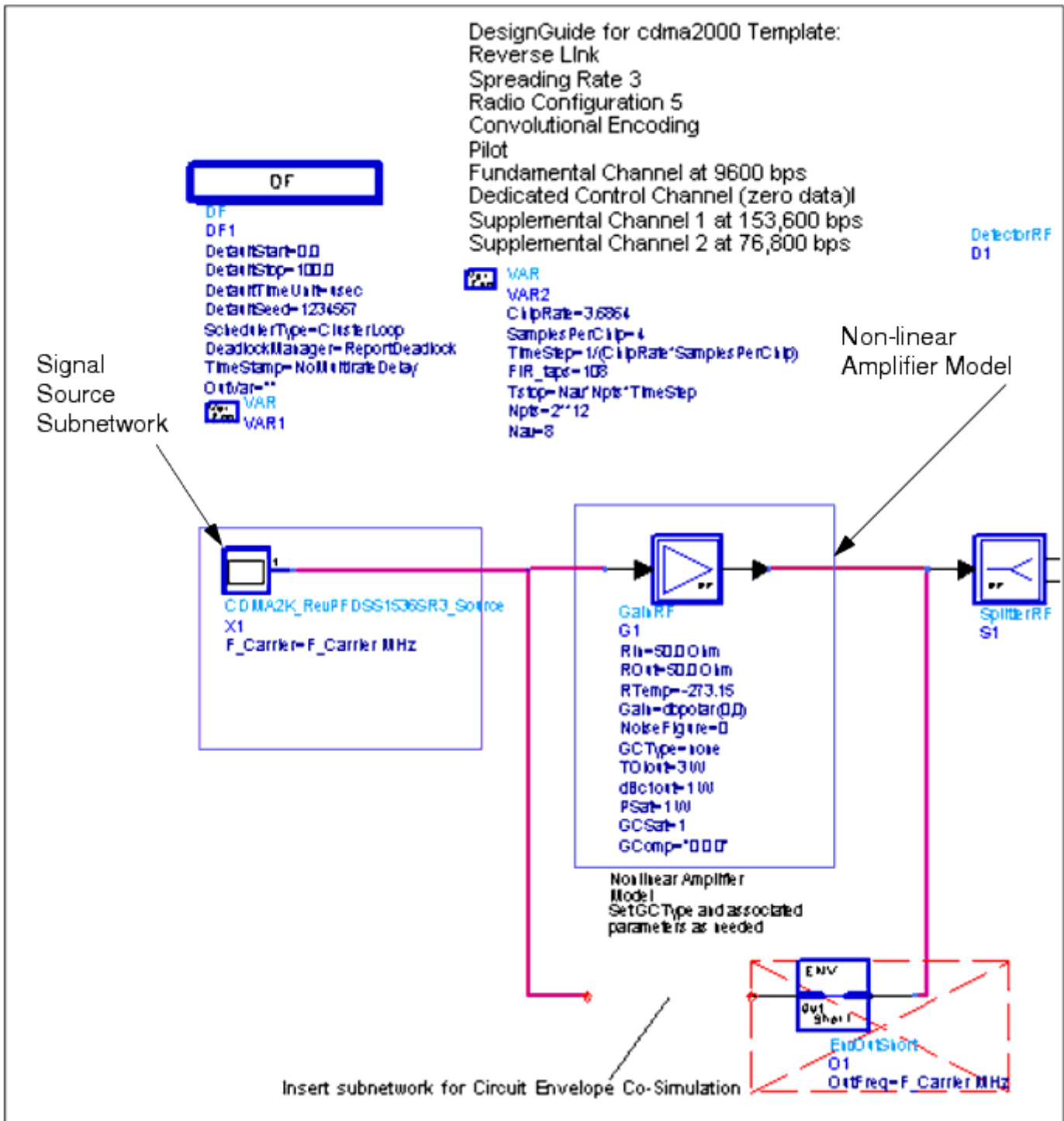
From this dialog box, you can select the desired signal source configuration from the options provided. Parameters include:

- Link: Forward, Reverse(Direct Spread only)
- SpreadType: Direct Spread, Multi-Carrier
- SpreadRate: SR1 (1.2288 Mbps), SR3 (3.6864 Mbps)
- Radio Configuration: RC3, RC5(Reverse Only), RC6
- Select Users: (Various Options)

After you have selected the desired option for each tab, select the next tab and repeat the process until all tabs have been defined.

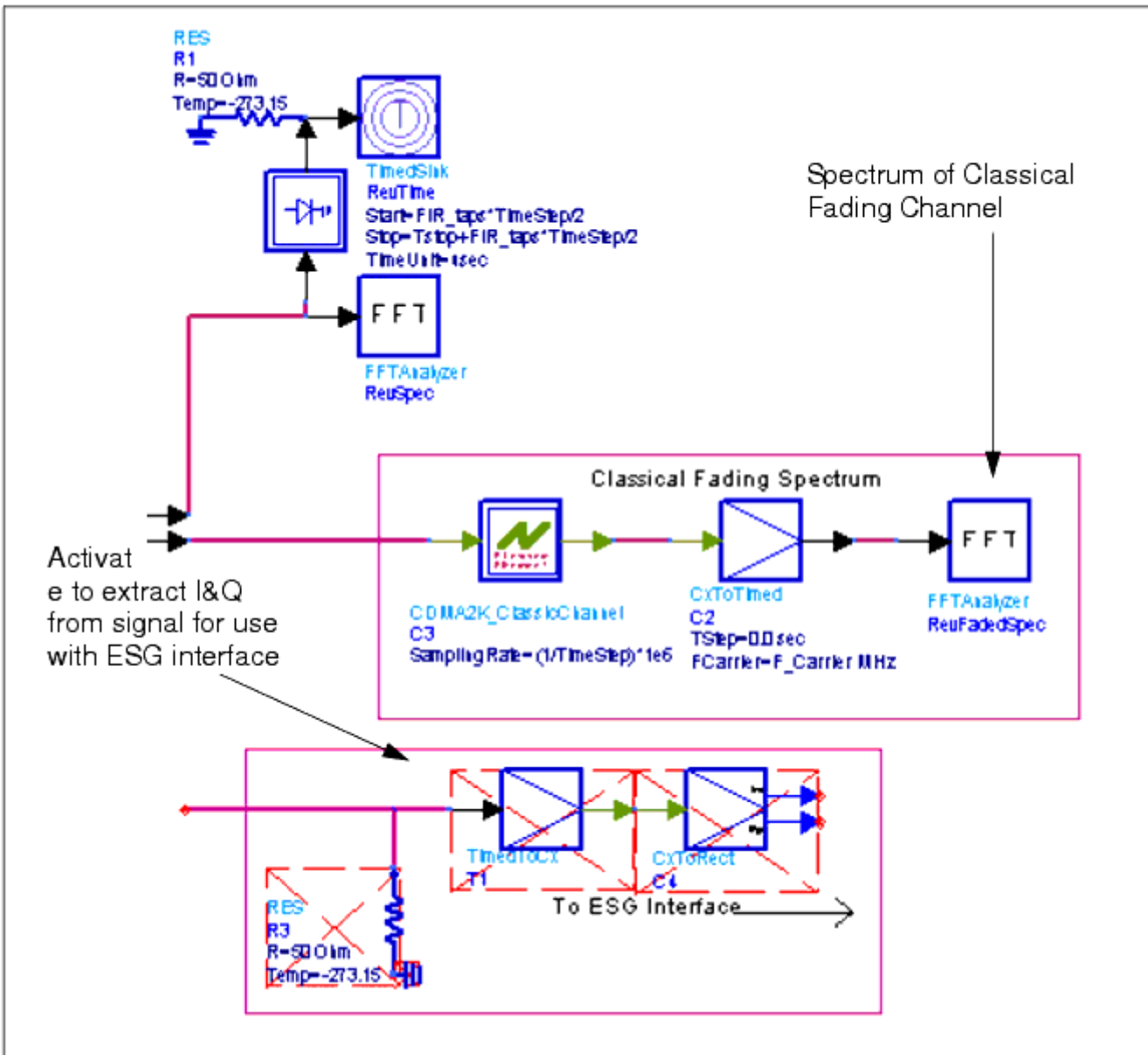
Note
On UNIX systems, the tab titles might appear differently from the preceding figure.

When you have finished selecting the source configuration, click **OK** to complete the process. A schematic will appear, and after a slight delay, a data display window will appear, showing the characteristics of the selected signal source.



Signal Source Template Features

The Non-linear Amplifier Model is set by default for linear operation. Modify the *GCType* and associated parameters (double click on the *GainRF* symbol to enter Edit mode, then click *Help* for detailed information on this model) to describe non-linear behavior, then choose *Simulate*. To co-simulate an Analog/RF model using the Circuit Envelope simulator, de-activate the *GainRF* component, place the Analog/RF subcircuit in the indicated location and activate the *EnvOutSelect* component.



More Signal Source Template Features

Available Signal Sources

Forward Link Sources

Signal Source Name	Description
DG_Fwd_RC3_PilotOnlySR1	Forward Pilot channel at SR1, Direct Spread
DG_Fwd_PilotOnlySR3	Forward Pilot channel at SR3, Direct Spread
DG_Fwd_RC3_PilotOnlySR3MC	Forward Pilot channel at SR3, Multi-Carrier
DG_Fwd_9ChannelDSSR1	Forward 9-channel at SR1, Direct Spread. Channels include: Pilot at 9.6 kbps, paging at 9.6 kbps, sync at 1.2 kbps, two fundamental (traffic) channels at 9.6 kbps, four supplemental channels at 19.2 kbps. Radio Configuration 3.
DG_Fwd_9ChannelDSSR3	Forward 9-channel at SR3, Direct Spread. Channels include: Pilot at 9.6 kbps, sync at 1.2 kbps, three fundamental (traffic) channels at 9.6 kbps, four supplemental channels at 38.4 kbps. Radio Configuration 6.
DG_Fwd_9ChannelMCSR3	Forward 9-channel at SR3, Multi-Carrier. Channels include: Pilot at 9.6 kbps, sync at 1.2 kbps, sync at 1.2 kbps, two fundamental (traffic) channels at 9.6 kbps, four supplemental channels at 19.2 kbps. Radio Configuration 6.

Reverse Link Sources

Signal Source Name	Description
DG_Rev_RC3_PilotOnly	Reverse Pilot Channel at SR1
DG_Rev_RC3_PFDSS1536	Reverse 4-channel signal at SR1. Channels include: Pilot, dedicated control channel, fundamental (traffic) channel, one supplemental channel at 153.6 kbps. Radio Configuration 5
DG_Rev_RC3_PFDSS1536	Reverse 5-channel signal at SR1. Channels include: Pilot, dedicated control channel, fundamental (traffic) channel at 9.6 kbps, two supplemental channels at 153.6 and 9.6 kbps. Radio Configuration 5
DG_Rev_RC5_PFDSS1536	Reverse 5-channel signal at SR3. Channels include: Pilot, dedicated control channel, fundamental (traffic) channel at 9.6 kbps, two supplemental channels at 153.6 kbps and 76.8 kbps. Radio Configuration 5
DG_Rev_RC5_PFDSS1536	Reverse 5-channel signal at SR3. Channels include: Pilot, dedicated control channel, fundamental (traffic) channel at 9.6 kbps, two supplemental channels at 153.6 kbps and 76.8 kbps. Radio Configuration 5