



## Sonnet<sup>®</sup> Lite Information

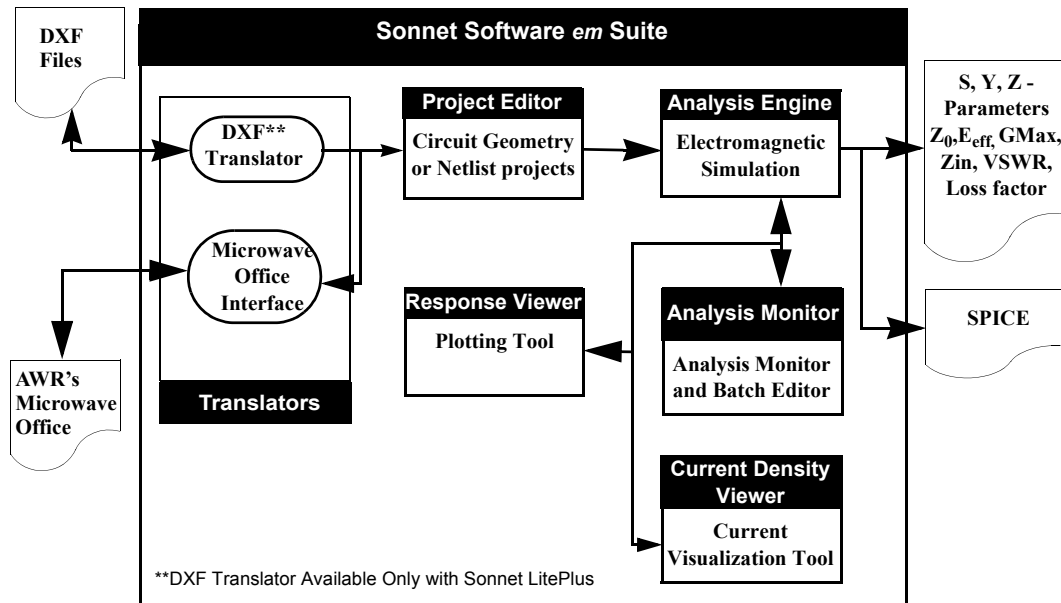
Sonnet Software provides commercial EDA software solutions for high-frequency electromagnetic (EM) analysis. Sonnet's suite of EM Software is aimed at today's demanding design challenges involving predominantly planar (3D planar) circuits and antennas. Predominantly planar circuits include microstrip, stripline, coplanar waveguide, PCB (single and multiple layers) and similar structures with vias, vertical metal sheets (z-directed strips) and any number of layers of metal traces embedded in stratified dielectric material. Electromagnetic analysis assumes the circuits are in a six-sided metal box to simulate a true metal enclosure, and accurately includes the effects of package resonances. Changing boundary conditions enables analysis under open environment conditions.

### The Sonnet Lite Suite

The suite of Sonnet analysis tools available in Sonnet Lite are described below. Limitations on both the unregistered and registered versions of Sonnet Lite are described later in this document.

<b>Project Editor</b>	The project editor is a user-friendly graphical interface that enables you to input your circuit geometry or circuit netlist for subsequent <i>em</i> analysis. If you have purchased Sonnet LitePlus, the DXF translator interface is found in the project editor. You also set up analysis controls for your project in the project editor.
<b>Analysis Engine</b>	<i>Em</i> is the electromagnetic analysis engine. It uses a modified method of moments analysis based on Maxwell's equations to perform a true three dimensional current analysis of predominantly planar structures. <i>Em</i> computes S, Y, or Z-parameters, transmission line parameters ( $Z_0$ , Eeff, VSWR, GMax, Zin, and the Loss Factor), and SPICE equivalent lumped element networks. Additionally, it creates files for further processing by the current density viewer and the far field viewer. <i>Em</i> 's circuit netlist capability cascades the results of electromagnetic analyses with lumped elements, ideal transmission line elements and external S-parameter data.
<b>Analysis Monitor</b>	The analysis monitor allows you to observe the on-going status of analyses being run by <i>em</i> as well as creating and editing batch files to provide a queue for <i>em</i> jobs.
<b>Response Viewer</b>	The response viewer is the plotting tool. This program allows you to plot your response data from <i>em</i> , as well as other simulation tools, as a Cartesian graph or a Smith chart. You may also plot the results of Sonnet pre-defined equations.
<b>Current Density Viewer</b>	The current density viewer is a visualization tool which acts as a post-processor to <i>em</i> providing you with an immediate qualitative view of the electromagnetic interactions occurring within your circuit.
<b>DXF Translator</b>	The DXF translator provides bidirectional translation of DXF layout files (such as from AutoCAD) to/from the Sonnet project editor geometry format. This program is available only in Sonnet LitePlus.
<b>Microwave Office Interface</b>	The Microwave Office Interface provides a seamless incorporation of Sonnet's world class EM simulation engine, <i>em</i> , into AWR's Microwave Office environment using Microwave Office's new EM socket. You can take advantage of Sonnet's accuracy without having to learn the Sonnet interface. Although, for advanced users who wish

to take advantage of powerful advanced features not presently supported in the integrated environment, the partnership of AWR and Sonnet has simplified the process of moving EM projects between Microwave Office and Sonnet.



## Sonnet LitePlus

Sonnet LitePlus is available for \$495 and includes all the functionality of Sonnet Lite and the following capabilities:

- **32 Megabyte memory limit.**

This is double the memory available in Sonnet Lite.

- **Maximum of 6 ports available.**

This allows you to use 2 more ports than Sonnet Lite.

- **Includes Optimization of one parameter.**

The Sonnet Professional suite allows you to optimize using an unlimited number of parameters. Sonnet LitePlus allows you to optimize using only one parameter. Optimization is not available in Sonnet Lite.

- **DXF Translator**

Sonnet LitePlus includes the DXF translator which allows bidirectional translation of DXF layout files (such as from AutoCAD) to/from the Sonnet project editor geometry format.

# Sonnet Lite Restrictions

Listed below are restrictions for the Sonnet Lite suite.



## WARNING

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**Sonnet Lite will NOT install or run if another version of Sonnet is installed.**

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- **Two metalization levels available.**

The Sonnet Professional suite allows an unlimited number of metalization levels; Sonnet Lite is limited to two metalization levels.

- **Maximum of three dielectric layers available.**

The Sonnet Professional suite allows an unlimited number of dielectric layers; Sonnet Lite is limited to three dielectric layers.

- **16 Mbyte memory limit for registered versions/1 Mbyte limit for unregistered.**

The Sonnet Professional suite allows use of an unlimited memory space, although most users limit the memory to the size of their physical memory. Sonnet Lite limits you to the use of 16 megabytes of memory for registered versions and 1 megabyte of memory for unregistered versions regardless of the physical memory available. To request a registered Sonnet Lite license, select *Start*  $\Rightarrow$  *Programs*  $\Rightarrow$  *Sonnet*  $\Rightarrow$  *Register* from the Windows desktop start menu.

- **Optimization not available.**

The Sonnet Professional suite allows you to create parameters in your circuits and optimize those parameters based on your stated goals. Optimization is not available for the Sonnet Lite suite. Optimization of one parameter is available in Sonnet LitePlus.

- **Maximum of one parameter allowed in a parameter sweep.**

The Sonnet Professional suite allows you to use an unlimited number of parameters when performing a parameter sweep. Only one parameter in a parameter sweep of a geometry project is allowed in the Sonnet Lite suite.

- **Remote *em* processing not available.**

The Sonnet Professional suite allows you to run an *em* analysis on a remote server on your network. Remote *em* processing is not available for the Sonnet Lite suite.

- **Dielectric bricks are not available.**

The Sonnet Professional suite allows for the use of dielectric bricks throughout a circuit. Dielectric bricks are not available for the Sonnet Lite suite. The Brick Mode button in the project editor tool box and the *Modify*  $\Rightarrow$  *Convert to Bricks* and the *Circuit*  $\Rightarrow$  *Brick Materials* menu items are disabled in the project editor.

- **Parallel subsections are not available.**

The Sonnet Professional suite allows you to remove parallel subsections where there is very little transverse current to reduce the number of subsections and improve processing time. Parallel subsections are not available in the Sonnet Lite suite. The *Circuit* ⇒ *Parallel Subsections* menu item in the project editor is disabled.

- **Kinetic inductance is not available.**

The Sonnet Professional suite allows the user to specify a kinetic inductance for a metal type for superconductor applications. This parameter is not available for the Sonnet Lite suite. The *Ls* parameter in the General definition in the Metal Editor dialog box in the project editor is disabled.

- **Maximum of 4 ports available.**

The Sonnet Professional suite allows an unlimited number of ports in a circuit. A maximum of 4 ports are allowed in the Sonnet Lite suite. After 4 ports have been added to a circuit in the project editor, the *Add Port* button on the tool box and the *Tools* ⇒ *Add Port* menu item are disabled. Sonnet LitePlus allows 6 ports.

- **All Port terminations must be 50-ohms.**

The Sonnet Professional suite allows you to set the port termination to any value. For Sonnet Lite, all port terminations must be 50-ohms.

- **The variables X Min and Y Min are not available.**

The Sonnet Professional suite allows you to control how the circuit is subsectioned by allowing you to set a minimum size for subsectioning in the x and y directions for any given polygon. In the Sonnet Lite suite these values are both set to the default value of 1. The *X Min* and *Y Min* text entry boxes in the Metalization Properties dialog box in the project editor are disabled. These fields are also disabled in the Select Matching Metal Polygons dialog box.

- **The variables X Max and Y Max are not available.**

The Sonnet Professional suite allows you to control how the circuit is subsectioned by allowing you to set a maximum size for subsectioning in the x and y directions for any given polygon. In the Sonnet Lite suite these values are both set to the default value of 100. The *X Max* and *Y Max* text entry boxes in the Metalization Properties dialog box in the project editor are disabled. These fields are also disabled in the Select Matching Metal Polygons dialog box.

- **Edge Meshing cannot be disabled.**

The Sonnet Professional suite allows you to use edge meshing for a particular polygon. In the Sonnet Lite suite edge meshing cannot be disabled. The Edge Mesh drop list is set to On in the Metalization Properties dialog box in the project editor.

- **Conformal Mesh and Diagonal-Fill not allowed.**

The Sonnet Professional suite allows you to choose from three different fill types: staircase, conformal mesh and diagonal. Conformal Mesh is a patented process that allows you to model geometries with diagonal or curved edges efficiently. Only staircase fill is available with the Sonnet Lite suite. The Fill type drop list in the Metalization Properties dialog box in the project editor is disabled.

- **Thick Metal.**

The Sonnet Professional suite allows you to define a metal type that uses physically thick metal. This metal type is not available with the Sonnet Lite suite.

- **Multi-Sweep ABS caching is not available.**

The Sonnet Professional suite allows you to retain the ABS cache data for multiple analysis sweeps of your project in order to save processing time in subsequent analyses. The Sonnet Lite suite only allows Start/Stop ABS caching which retains the cache data only if an analysis is interrupted.

- **Circuit Subdivision.**

The Sonnet Professional suite allows you to take a large circuit and automatically split it into any number of smaller projects, then connect the results in a netlist project to produce a response for the whole circuit. This feature is not available in the Sonnet Lite suite.

- **Advanced Subsection Control is not available.**

The Sonnet Professional suite allows you to control how the circuit is subsectioned by allowing you to set a maximum size for subsectioning in terms of subsections/lambda, specifying the subsectioning frequency, entering the effective dielectric constant and adjacent level polygon edge checking. In the Sonnet Lite suite these values are set to default or automatically calculated by *em*. The Advanced Subsectioning Controls dialog box (*Analysis*  $\Rightarrow$  *Advanced Subsectioning*) in the project editor is disabled.

- **The De-embed run option is always enabled.**

The circuit is automatically de-embedded to the specified reference planes, or the box edge if no reference planes are specified in the geometry file when this option is set. For a detailed discussion of de-embedding refer to Chapters 7 and 8 of the **Sonnet User's Guide**. For the Sonnet Professional suite the user may choose to turn this option on or off. For Sonnet Lite, the option is always enabled.

- **Run Options not available in Analysis Setup for Sonnet Lite.**

The following run options available with the Sonnet Professional suite are not available for Sonnet Lite: Memory Save, and Multi-Frequency Caching. The controls for these options are disabled in the Analysis Setup dialog box and the Advanced Options dialog box in the project editor.

These options are available with the Sonnet Professional suite. For details about any of these run options, refer to the **Sonnet User's Guide** and the project editor's online help.

- **User-defined Equations are not available in Sonnet Lite.**

The Sonnet Professional suite has a feature in the response viewer that allows you to define a curve as a function of a pre-defined equation or as a function of a user-defined equation. The Sonnet Lite suite only provides the pre-defined equations which are delivered with the software. The user may not define their own equations.

- **Cadence Virtuoso Interface is not available in Sonnet Lite.**

As an optional feature for the Sonnet Professional Suite, you may purchase the Cadence Virtuoso Interface. The Cadence Virtuoso interface is a completely new Sonnet plug-in for the Cadence Virtuoso suite which enables the RFIC designer to configure and run the EM analysis from a layout cell, extract accurate electrical models, and create a schematic symbol for Analog Artist and RFDE simulation. This option is not available in Sonnet Lite.

- **Broadband Spice Extractor is not available in Sonnet Lite.**

As an optional feature for Sonnet Level2 Suites and above, you may purchase the Broadband Spice Extractor. The new Broadband Spice Extraction feature allows you to extract a distributed circuit model of a passive circuit which is valid over a broad band. The Broadband Spice Extractor feature generates models that can be used in Spice as a “black box” representing the broadband behavior of your circuit. This option is not available for Sonnet Lite.

## **Contacting Sonnet**

If you are interested in obtaining more information about Sonnet products, or how to obtain the Sonnet Professional suite, please contact Sonnet using the information below.

**Sonnet Software, Inc.**  
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**North Syracuse, NY 13212 USA**  
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**E-mail: [info@sonnetsoftware.com](mailto:info@sonnetsoftware.com)**  
**Web: [www.sonnetsoftware.com](http://www.sonnetsoftware.com)**

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AWR and Microwave Office are trademarks of Applied Wave Research, Inc.

Cadence and Virtuoso are registered trademarks of Cadence Design Systems, Inc.



## Sonnet<sup>®</sup> Overview

Sonnet Software provides commercial EDA software solutions for high-frequency electromagnetic (EM) analysis. Sonnet's suite of EM Software is aimed at today's demanding design challenges involving predominantly planar (3D planar) circuits and antennas. Predominantly planar circuits include microstrip, stripline, coplanar waveguide, PCB (single and multiple layers) and similar structures with vias, vertical metal sheets (z-directed strips) and any number of layers of metal traces embedded in stratified dielectric material. Electromagnetic analysis assumes the circuits are in a six-sided metal box to simulate a true metal enclosure, and accurately includes the effects of package resonances. Changing boundary conditions enables analysis under open environment conditions.

**Project Editor**      The project editor is a user-friendly graphical interface that enables you to input your circuit geometry or circuit netlist for subsequent *em* analysis. If you have purchased the DXF and/or the GDSII translator, the translator interface is found in the project editor. You also set up analysis controls for your project in the project editor.

Program module: *xgeom*

**Analysis Engine**      *Em* is the electromagnetic analysis engine. It uses a modified method of moments analysis based on Maxwell's equations to perform a true three dimensional current analysis of predominantly planar structures. Em computes S, Y, or Z-parameters, transmission line parameters (Z0, Eeff, VSWR, GMax, Zin, and the Loss Factor), and SPICE equivalent lumped element networks. Additionally, it creates files for further processing by the current density viewer and the far field viewer. Em's circuit netlist capability cascades the results of electromagnetic analyses with lumped elements, ideal transmission line elements and external S-parameter data. Parameterization is limited to one parameter for Sonnet Lite. Optimization of one parameter is available in Sonnet LitePlus.

Program module: *em*

**Analysis Monitor**      The analysis monitor allows you to observe the on-going status of analyses being run by *em* as well as creating and editing batch files to provide a queue for *em* jobs.

Program module: *emstatus*

**Response Viewer**      The response viewer is the plotting tool. This program allows you to plot your response data from em, as well as other simulation tools, as a Cartesian graph or a Smith chart. You may also plot the results of Sonnet pre-defined equations as well as defining your own equations. Sonnet Lite does not allow you to define your own equations.

Program module: *emgraph*

**Current Density Viewer**      The current density viewer is a visualization tool which acts as a post-processor to *em* providing you with an immediate qualitative view of the electromagnetic interactions occurring within your circuit.

Program module: *emvu*

**Far Field Viewer**

The far field viewer is the radiation pattern computation and display program. It computes the far-field radiation pattern of radiating structures (such as patch antennas) using the current density information from *em* and displays the far-field radiation patterns in one of three formats: Cartesian plot, polar plot or surface plot. This program is not available in Sonnet Lite.

Program module: *patvu*

**GDSII Translator**

The GDSII translator provides bidirectional translation of GDSII layout files to/from the Sonnet project editor geometry format. This program is not available in Sonnet Lite.

Program module: *gds*

**DXF Translator**

The DXF translator provides bidirectional translation of DXF layout files (such as from AutoCAD) to/from the Sonnet project editor geometry format. This program is available only in Sonnet LitePlus.

Program module: *dxfgeo*

**Agilent Interface**

The Agilent Interface provides a seamless translation capability between Sonnet and Agilent Series IV and Agilent ADS. From within the Series IV or ADS Layout package you can directly create Sonnet geometry files. *Em* simulations can be invoked and the results incorporated into your design without leaving the Series IV or ADS environment. This program is not available in Sonnet Lite.

Program module: *ebbridge*

**Microwave Office Interface**

The Microwave Office Interface provides a seamless incorporation of Sonnet's world class EM simulation engine, *em*, into the Microwave Office environment using Microwave Office's EM socket. You can take advantage of Sonnet's accuracy without having to learn the Sonnet interface. Although, for advanced users who wish to take advantage of powerful advanced features not presently supported in the integrated environment, the partnership of AWR and Sonnet has simplified the process of moving EM projects between Microwave Office and Sonnet.

Program Module: *sonntawr*

**Cadence Virtuoso Interface**

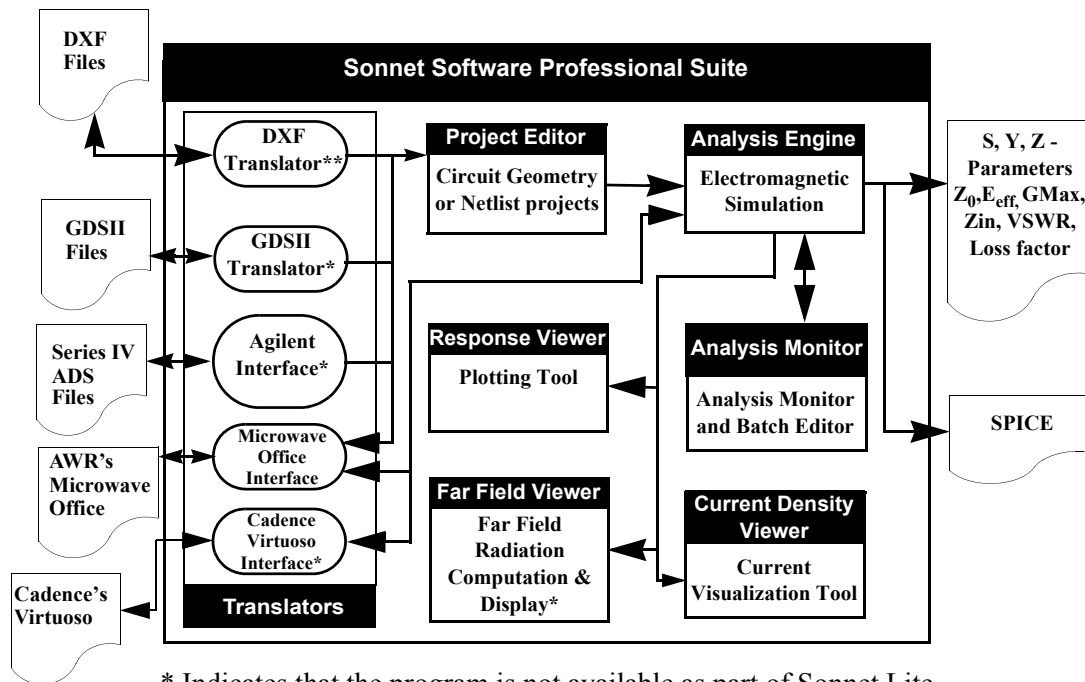
This Sonnet plug-in for the Cadence Virtuoso suite enables the RFIC designer to configure and run the EM analysis from a layout cell, extract accurate electrical models, and create a schematic symbol for Analog Artist and RFDE simulation. This program is not available in Sonnet Lite.

Program Module: *sonntcds*

**Broadband Spice Extractor**

A new Broadband Spice extraction module is available that provides high-order Spice models. In order to create a Spice model which is valid across a broad band, the Sonnet broadband SPICE feature finds a rational polynomial which "fits" the S-Parameter data. This polynomial is used to generate an equivalent lumped element circuits which may be used as an input to either PSpice or Spectre. Since the S-Parameters are fitted over a wide frequency band, the generated models can be used in circuit simulators for AC sweeps and transient simulations. This program is not available in Sonnet Lite.





\* Indicates that the program is not available as part of Sonnet Lite

\*\*Indicates that the program is available in Sonnet LitePlus

## Sonnet Products

For an overview of Sonnet Products, please select *Help* ⇒ *Sonnet Products* from the main menu of any Sonnet program.

## Contacting Sonnet

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## How to Register Sonnet Lite

Registration is free, easy and fast. Registering Sonnet Lite will increase the size of the circuits you can analyze from 1 MByte to 16 MBytes. **You must perform the registration on each machine on which you wish to run Sonnet Lite.** To register, perform the following:

- 1      Select *Start*  $\Rightarrow$  *Programs*  $\Rightarrow$  *Sonnet*  $\Rightarrow$  *Register* from the Windows desktop start menu.
- 2      The registration window appears on your display. Follow the on-screen instructions to complete your registration.