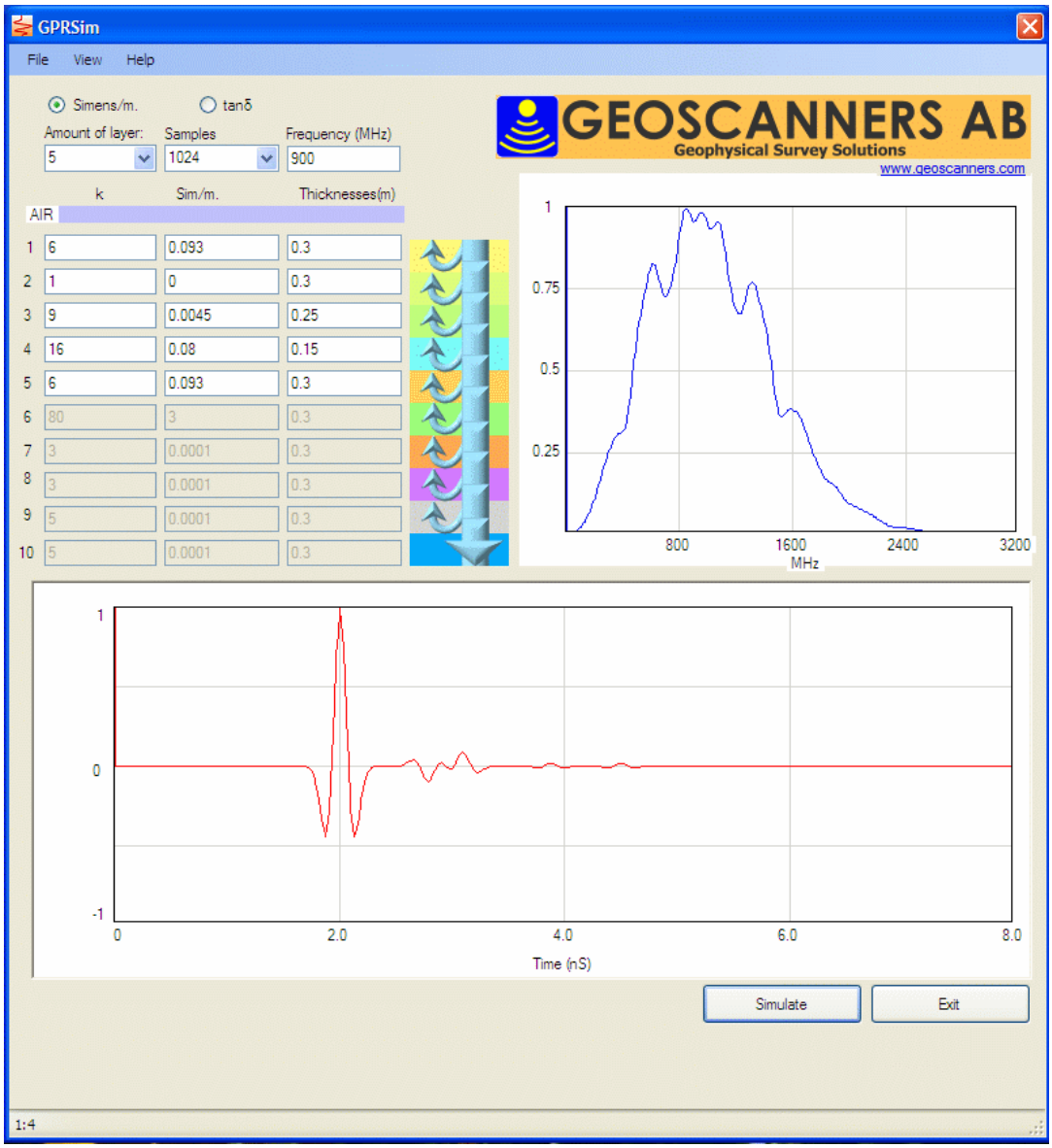
GPRSim.net

User guide



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Overview

GPRSim.net is a basic GPR time domain simulation tool. It is partially based in the transmission line model and allows up to ten layers to be simulated with frequencies ranging from 200 to 2000 MHz. It can be used to try out different real world survey scenarios and understand how different center frequency antennas could perform, as well as getting an idea of how the ground penetrating radar A-scan might look like in the given conditions.

All layers are defined using only three parameters: relative dielectric constant or permittivity (epsilon), electric conductivity (sigma) and the physical thickness of the layer. Instead of the electric conductivity (sigma) it is possible to enter the value for the loss tangent. The model assumes the relative permeability is equal to one.

The results of the simulation are displayed in the time and frequency domains and it is possible to print out the time domain plot. Different survey scenarios can be stored as csv files for quick access.

There is no need to register GPRSim.net in order to use it in commercial or non-commercial purposes but we would appreciate if you do so. Registering is a good way of getting the last updates, tutorials etc.

We appreciate any kind of comments, suggestions, bug reports etc that you as the end user could send to us. Please use the following e-mail address and don't forget to insert in the subject line the words **GPRSim.net** otherwise it goes directly into the deleted items bin.
e-mail: support@geoscanners.com

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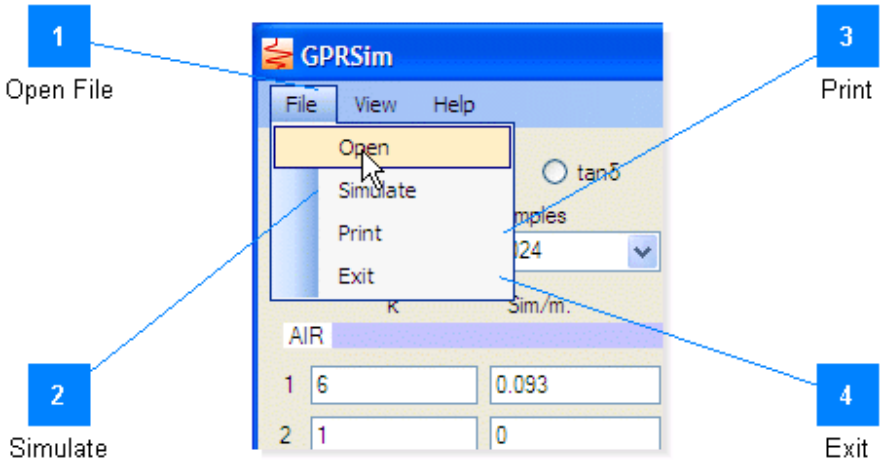
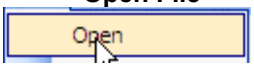
Main Menu



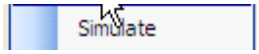
This is the main menu, here you can open a csv file, run a simulation and print the results from here.

1 **Open File**



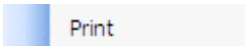
Opens a csv file with values properly formatted.

2 **Simulate**



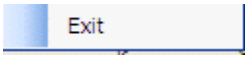
Run a simulation after all the parameters for the layers have been entered.

3 **Print**



Print the result of the simulation in the time domain. The output file is formatted as landscape.

4 **Exit**



Exit the application.

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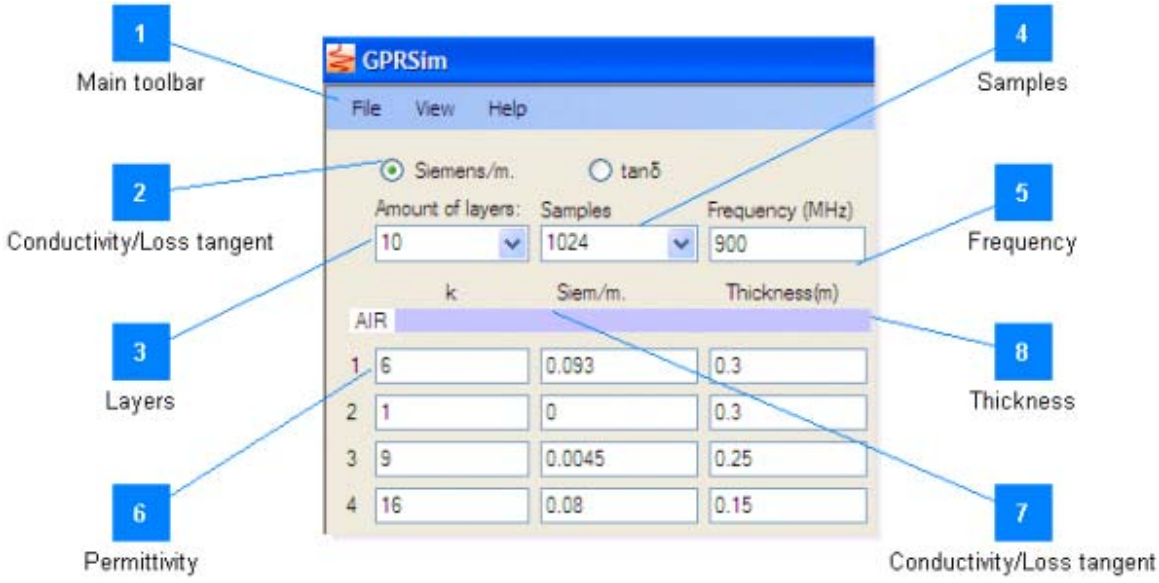
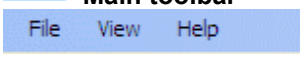
Entering Data in GPRSim.net



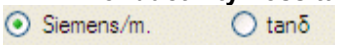
This is the main window of the application; here you enter all parameters for running the simulation. Select the appropriate values for all the fields and enter the data or load a previously saved csv file.

Main toolbar



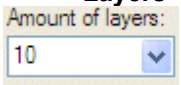
Main toolbar.

Conductivity/Loss tangent



Select with the radio button which parameter shall be entered and displayed for each layer.

Layers



Select from the drop-down menu the required amount of layers. Note that the first layer or layer zero is always air and it cannot be edited. The first reflection to appear in the time domain plot is the reflection from the surface, that is the reflection from the interface air-layer one. The

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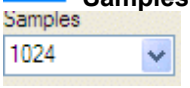
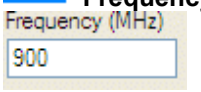
thickness of the last layer plays no roll whatsoever in the simulation, only the relative dielectric constant and the conductivity or loss tangent. The thickness of the last layer is taken to be infinite.

4 **Samples**



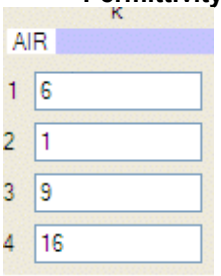
Select the amount of points for the simulation, this is equivalent to the amount of samples per scan in the radar.

5 **Frequency**



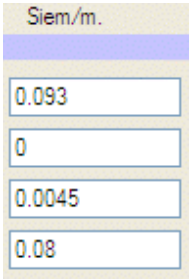
Enter the operating frequency of the antenna in megahertz. The range of allowed frequencies is between 200 MHz and 2000 MHz.

6 **Permittivity**



Enter the value of the permittivity (relative dielectric constant) for every layer.

7 **Conductivity/Loss tangent**



Enter the conductivity in simens per meter or the loss tangent for every layer. Depending on what parameter was selected in the radio button the proper label appear here. If conductivity was selected then the value will change according to the selected operating frequency. This happens every time the operating frequency is changed.

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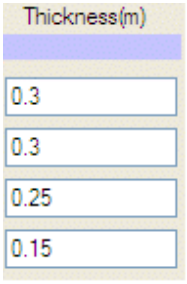
8 **Thickness**



Enter here the thickness for every layer in meters.

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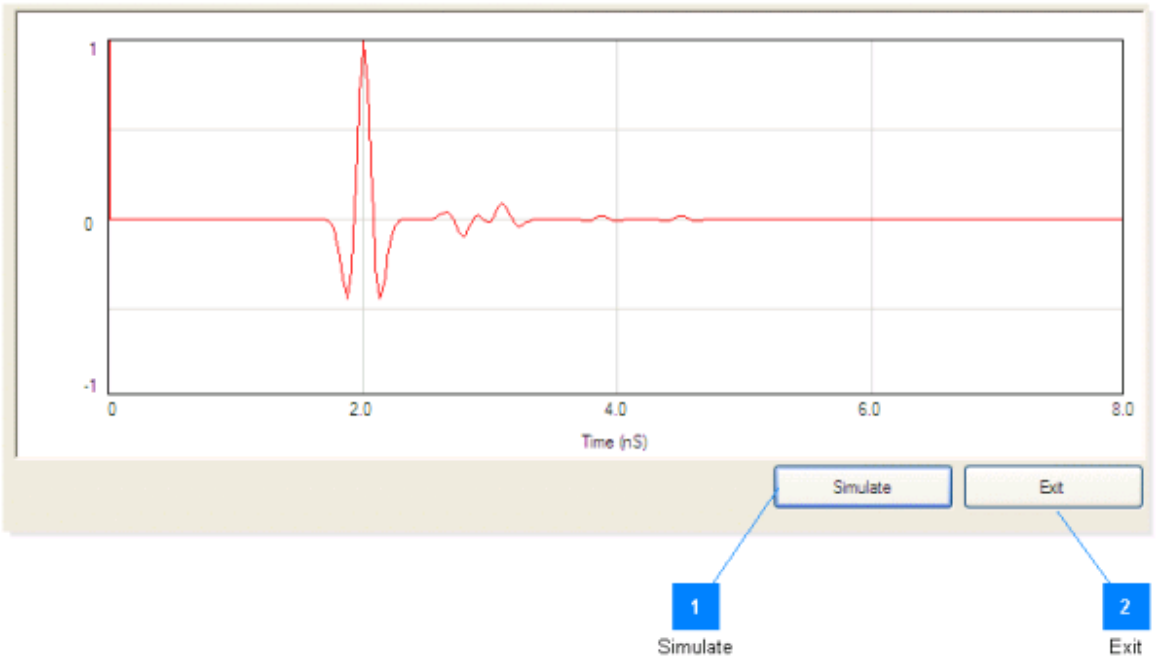
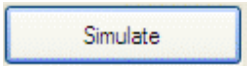
Simulation



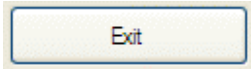
When all the parameters have been entered the simulation can be executed either by pressing the simulation button or from the file menu.

1 **Simulate**



Press this button to perform a simulation with the set of parameters entered previously.

2 **Exit**



Exit the simulation and the application as well.

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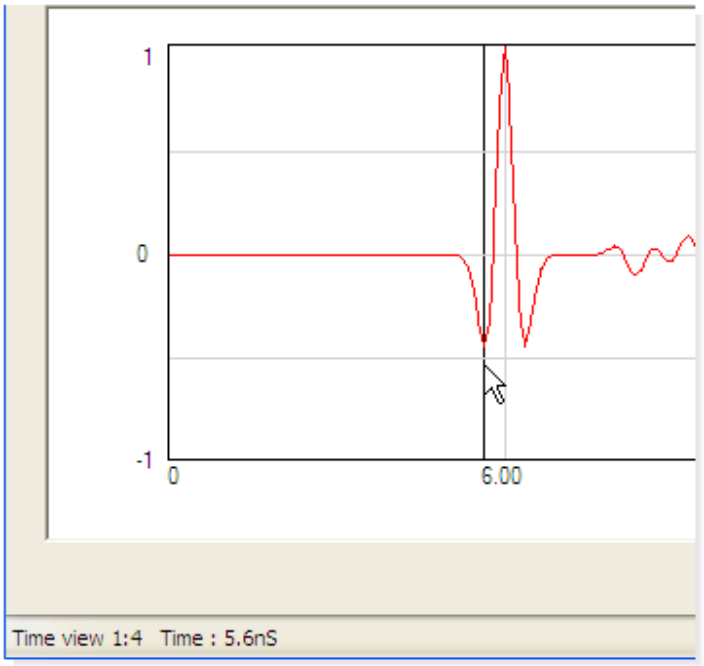
Cursors



By pressing the left button of the mouse it is possible to display a cursor on the time and frequency domains plots. The time or frequency are displayed then in the status bar.

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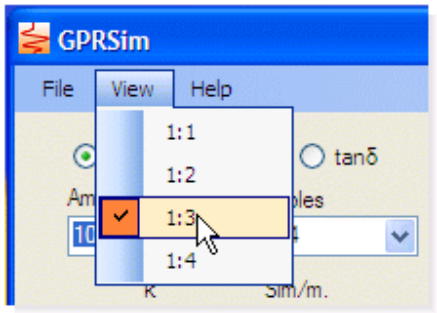
View



Select here how many samples will be displayed. The range is between full range 1:1 down to one quarter of the range. The spectrum of the signal is not affected by these settings.

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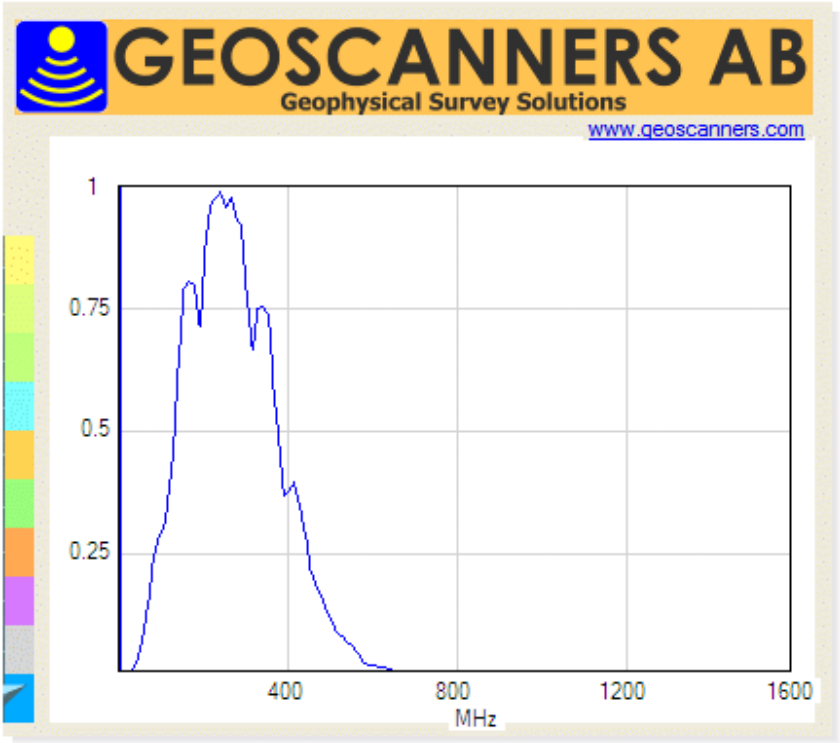
Spectrum



This window displays the spectrum of the time domain plot results of the simulation.

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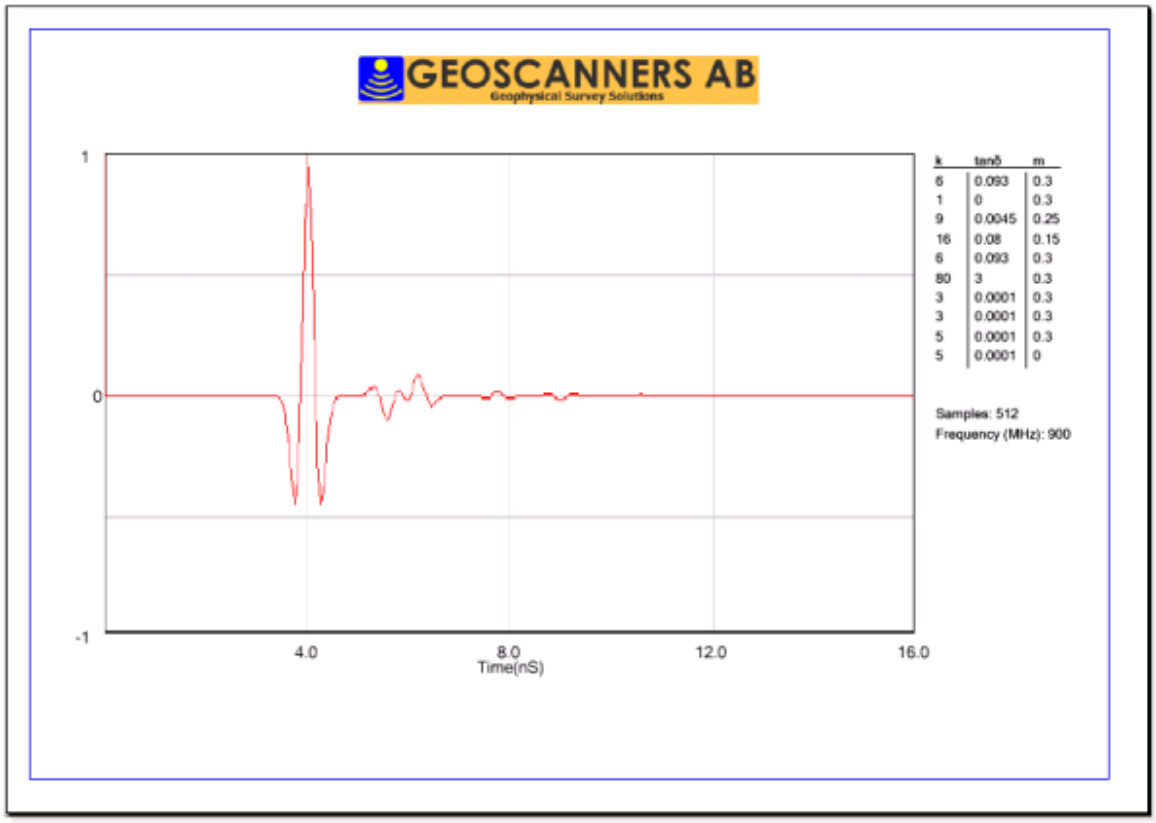
Print Layout



Print layout of the simulation results in the time domain.

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CSV File

The CSV file to load into GPRSim.net can be written in NOTEPAD and must be formatted as follows:

tan or siem
amount of layers, amount of samples, frequency in MHz
text1, epsilon1, sigma1 or tan1, thickness1
text2, epsilon2, sigma2 or tan2, thickness2
……
tex10, epsilon10, sigma10 or tan10, thickness10

In the first line enter tan or siemens depending on what kind of parameter is desired.
In the second line enter the amount of layers and samples together with the operating frequency.
The amount of lines that follow depends on how many layers are selected in the second line and up to
10 layers can be specified.The thickness is always entered in meters.

Example File:

siem
3, 1024, 900
sand, 5, 0.01, 1
air, 1, 0, 0.01
sand, 5, 0.01, 3

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