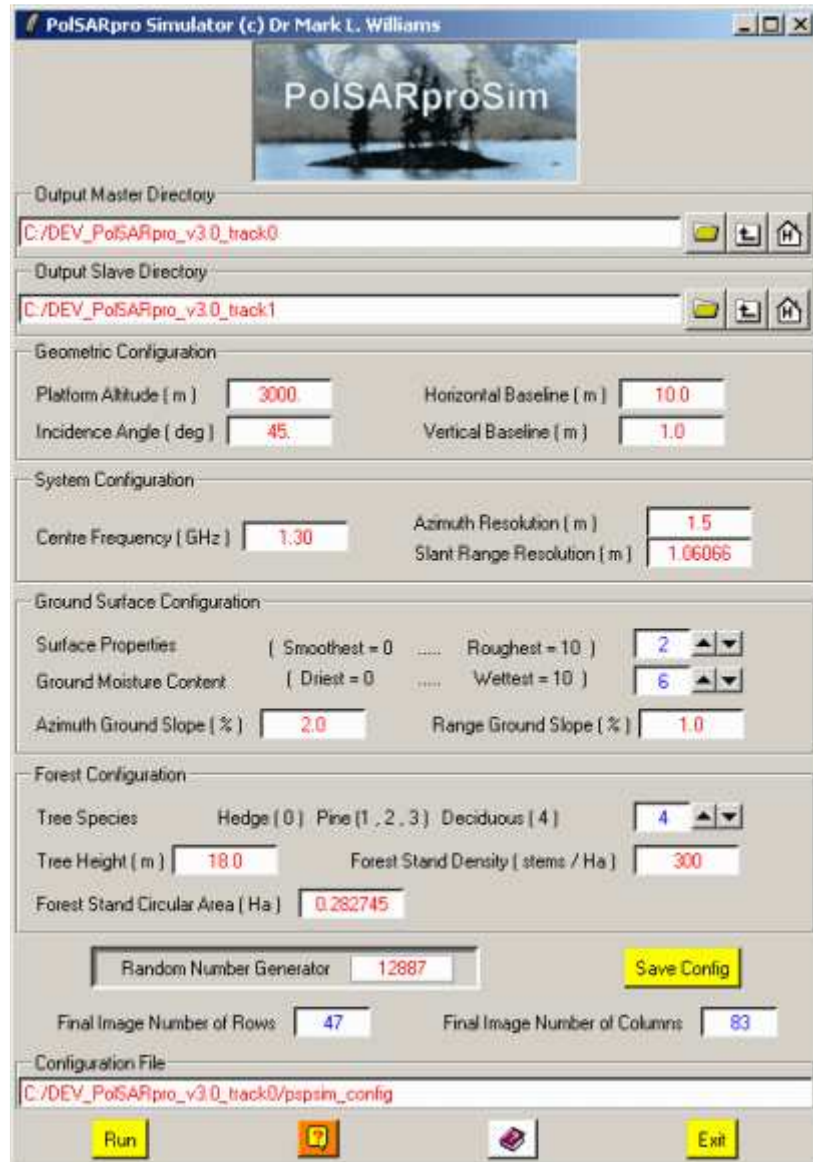


## PolSARpro Simulator © Dr Mark L. Williams



### Description:

**PolSARproSim** calculates simulated Synthetic Aperture Radar (SAR) imagery of model forest stands. **PolSARproSim** is an educational tool: providing simulated test data of sufficient fidelity to be used within the tutorial package of **PolSARpro v4.0**. The simulated imagery can be used to illustrate the concepts of the PolInSAR lecture course.



**Note:** By clicking on this widget button, users may access the technical documentation for PolSARproSim.

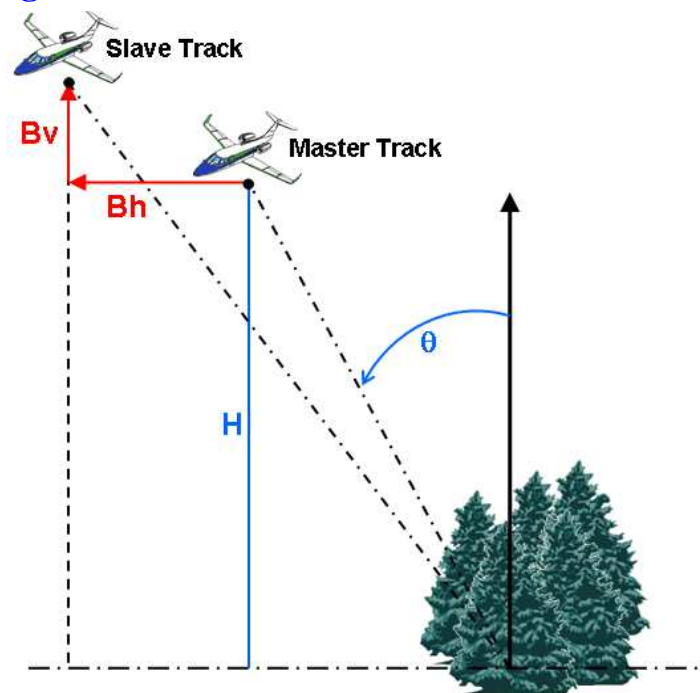
## Comments:

Parameters written in Red can be modified directly by the user from the keyboard.

## Input/Output Arguments:

**Output Master Directory** Indicates the location of the output data **Main Master Directory (M-MD)**.  
**Output Slave Directory** Indicates the location of the output data **Main Slave Directory (M-SD)**.

## Geometric Configuration:



**Platform Altitude** The **Platform Altitude (H)** of the Master Track is specified in metres.

**Incidence Angle** The **Incidence Angle ( $\theta$ )** is specified in degrees and is defined as the angle between the global vertical direction and the Master Track radar line of sight as shown.

**Horizontal Baseline** The **horizontal baseline (Bh)** is specified in metres and is the difference in ground range between the Master Track and the Slave Track.

**Vertical Baseline** The **vertical baseline (Bv)** is also specified in metres and is the difference in **Platform Altitude** between the Master Track and the Slave Track.

**Note:** The horizontal and vertical baseline red arrows in the diagram indicate the directions of positive baseline values.

## System Configuration:

**Centre Frequency** The **Centre Frequency** is specified in gigahertz (GHz).

**Azimuth** The **Azimuth Resolution** is specified in metres. For the purposes

<b>Resolution</b>	of <b>PolSARproSim</b> , <b>Azimuth Resolution</b> is defined to be the width in azimuth of the point spread function at half height power.
<b>Range Resolution</b>	The (slant) <b>Range Resolution</b> is specified in metres. For the purposes of <b>PolSARproSim</b> , <b>Range Resolution</b> is defined to be the width in slant range of the point spread function at half height power. <b>Note:</b> The slant range resolution is the same for each track, corresponding to constant system bandwidth. Typically, better resolutions require longer computations.

## Ground Surface Configuration:

<b>Surface Properties</b>	This parameter has the minimum value zero (0), corresponding to the smoothest surface, and the maximum value ten (10), corresponding to the roughest surface. This value is translated into values for surface height standard deviation and correlation length within <b>PolSARproSim</b> . <b>Note:</b> Roughening the surface reduces the strength of ground-volume scattering.
<b>Ground Moisture Content</b>	This parameter has the minimum value zero (0), corresponding to the driest surface, and the maximum value ten (10), corresponding to the wettest surface. This value is translated into a value for soil surface moisture content within <b>PolSARproSim</b> . <b>Note:</b> wetter surfaces reflect more microwave energy.
<b>Azimuth Ground Slope</b>	The <b>Azimuth Ground Slope</b> is a dimensionless quantity expressed as a percentage (%). It specifies the slope of the underlying mean terrain in the azimuth direction.
<b>Range Ground Slope</b>	The <b>Range Ground Slope</b> is a dimensionless quantity expressed as a percentage (%). It specifies the slope of the underlying mean terrain in the ground range direction. <b>Note:</b> both slopes affect the strength and focus of ground-volume scattering terms.

## Forest Configuration:

<b>Tree Species</b>	This parameter is used to define the nominal species of tree occupying the forest stand. Possible values are indicated in the widget. <b>Notes:</b> A “hedge” is a random collection of branches and leaves in the volume of the forest stand. “Pine” trees are tall and thin, whilst “deciduous” trees can have wide crowns.
<b>Tree Height</b>	The mean height of the trees specified in metres. <b>Note:</b> generally speaking the taller the tree, the wider the tree.
<b>Forest Stand Density</b>	The <b>Forest Stand Density</b> is the requested number of trees per unit area specified in trees per hectare. <b>Note:</b> tree crowns have finite dimensions and whilst they may overlap slightly, they do not overlap completely. The maximum possible stand density depends upon both tree species and mean

tree height. If the user requested value is too large **PolSARproSim** will attempt to simulate a forest with the maximum possible stand density.

**Forest Stand Circular Area** The **Forest Stand Circular Area** is the area of the circle occupied by the forest stand and is specified in hectares.  
**Note:** larger forest stand areas mean longer computations.

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**Random Number Generator** This value is used to seed the random number generator.  
**Note:** a random number is automatically generated when this function widget is launched, but the user may change the value as desired.

**Save Config** Save the parameters for input to **PolSARproSim** in the **Configuration File** (a text file with the extension “.sar”), and calculate the dimensions of the SAR images.  
**Note:** computation time increases with increasing image dimensions. To reduce image dimensions you may increase resolution lengths, or reduce the stand area. Image dimensions also depend upon the height of the forest stand, and the incidence angle

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## Output Files

The file *config.txt* is output by **PolSARpro** to both the **Output Master Directory** and the **Output Slave Directory**.

**PolSARproSim** stores the  $2 \times 2$  complex Sinclair matrix in the binary data files *s11.bin*, *s12.bin*, *s21.bin* and *s22.bin*.

**PolSARproSim** generates a graphic image of the simulated area and stores it in **BMP** format as the file *forest\_image.bmp* in the **Output Master Directory**.

In addition, in the **Output Master Directory**, **PolSARproSim** also creates the text files “*configfile\_prefix\_call.txt*”, “*configfile\_prefix.out*” and “*configfile\_prefix.log*”, where *configfile\_prefix* is the file name entered by the user in the **Save Config** section. These files form a record of **PolSARproSim** activity, but are not required for the **PolInSAR** tutorial.

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