RadarPre
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ACT Toolkit for ANSYS Electronics Desktop (AEDT)
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RadarPre - Overview

- Name of the app: RadarPre
- Target application: ElectronicsDesktop
- Description: Automate analysis setup for simulation of radar Range Profiles, Waterfall plots and Inverse Synthetic Aperture (ISAR) images.

The version of the App and the supported versions of ANSYS are the ones indicated on the App Store.

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ACT App Store

- [https://appstore.ansys.com/shop/ACTApps_act%20apps](https://appstore.ansys.com/shop/ACTApps_act%20apps)
- Great place to get started
  - A library of helpful applications available to any ANSYS customer
  - New apps added regularly
  - Applications made available in either binary format (.wbex file) or binary plus scripted format (Python and XML files)
  - Scripted extensions are great examples
• Please pay attention to paragraph 9 of the CLICKWRAP SOFTWARE LICENSE AGREEMENT FOR ACS EXTENSIONS regarding TECHNICAL ENHANCEMENTS AND CUSTOMER SUPPORT (TECS): “TECS is not included with the Program(s)”

• Report any issue or provide feedback related to this app please contact:

  Contact email address: Arien.Sligar@ansys.com
Binary App Installation

Installing from the Electronics Desktop:

1. From the Electronics Desktop framework, select the “View” option
2. Click on “ACT Extensions”
3. Press “+” symbol in the top right corner of the ACT Home application page
4. It will open a file dialog to select the “RadarPre.wbex” binary file
5. The extension is installed

Loading the extension:

1. From the Extension Manager, click on your extension and choose ‘Load Extension’
2. The extension is loaded

Notes:
- The extension to be installed will be stored in the following location: %AppData%\Ansys\[version]\ACT\extensions
- The installation will create a folder in this location, in addition to the .wbex file
- Example for [version]: v180
RadarPre ACT Extension

Creates analysis setup and output data reports required for radar data processing for three popular types of radar target imaging reports.

Range (echo) profile
Waterfall plot
Inverse Synthetic Aperture Radar (ISAR) image
RadarPre Toolkit

Select from among the active projects and designs open in AEDT.

Select the type of imaging you wish to perform (Range Profile, Waterfall, ISAR).

Fill in the relevant parameters for the imaging you wish to perform. Select center frequency, look angle (for incoming plane wave), units, total imaging extent(s), and imaging resolution. Finer resolution will require higher bandwidth and more samples. Finally, select the polarization (co- or cross-pol) for imaging.

Click “Preview” to fill in the Simulation Settings box. This will show the analysis requirements in terms of the software analysis setup.

Click “Generate Radar Setup” to translate the settings in the form to an Analysis Setup definition. Reports will also be generated in the Reports tree to be used by the RADARpost ACT toolkit.
Range Profile setup

• Range (or echo) profiles provide a 1D indication of radar echos for a band-limited radar pulse in the range (time) domain
• The pulse is assumed to be a plane wave excitation
• RadarPre sets up the frequency domain analysis setup
• Use RadarPre after the model has been created and positioned at the Global origin location, and materials and boundary conditions have been defined

\[ \Delta f = \frac{c_0}{2 \cdot x_{\text{max}}} \]

\[ \text{Bandwidth} = \Delta f \cdot N_x \]
Waterfall plot analysis setup

- Waterfall plot is a collection of range profiles over incident angles swept in the Azimuth (X-Y) plane
- Each pulse is assumed to be a plane wave excitation with specified bandwidth/range resolution
- RadarPre sets up the frequency domain analysis setup and plane wave excitation sweep (0 to 359 degrees in 1 degree increments)
- Use RadarPre after the model has been created and positioned at the Global origin location, and materials and boundary conditions have been defined
- Specify the total Down Range Extents (centered about the Global origin) and Down Range Resolution for range profiles
- Use Preview button to show Simulation Settings for current Radar Requirements
ISAR image analysis setup

- ISAR image is a 2D projection of monostatic range-crossRange radar scatterers for a center frequency and a prescribed angle of incidence
- RadarPre sets up the frequency domain analysis setup and plane wave excitation sweep. Frequencies and angles depend upon Range/Down Range extents and resolution specification
- Use RadarPre after the model has been created and positioned at the Global origin location, and materials and boundary conditions have been defined
- Specify the total Down Range Extents (centered about the Global origin) and Down Range Resolution for range profiles
- Look Angle is the Azimuth (X-Y) plane angle for primary incidence
- Use Preview button to show Simulation Settings for current Radar Requirements

\[
N_x = \frac{x_{\text{max}}}{\Delta x} \quad N_y = \frac{y_{\text{max}}}{\Delta y} \\
\Delta f = \frac{c_0}{2 \cdot x_{\text{max}}} \\
\Delta \varphi = \frac{\lambda_c}{2 \cdot y_{\text{max}}} \\
\text{Bandwidth} = \Delta f \cdot N_x \\
\text{Aspect Angle} = \Delta \varphi \cdot N_y
\]
Thank you

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