SIEMENS EDA

Monte Carlo Analysis

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Objective

At the end of this Support Kit, you should be able to do the following:

- Set parameter distribution
- Run a Monte Carlo simulation
- Analyze Monte Carlo simulation results

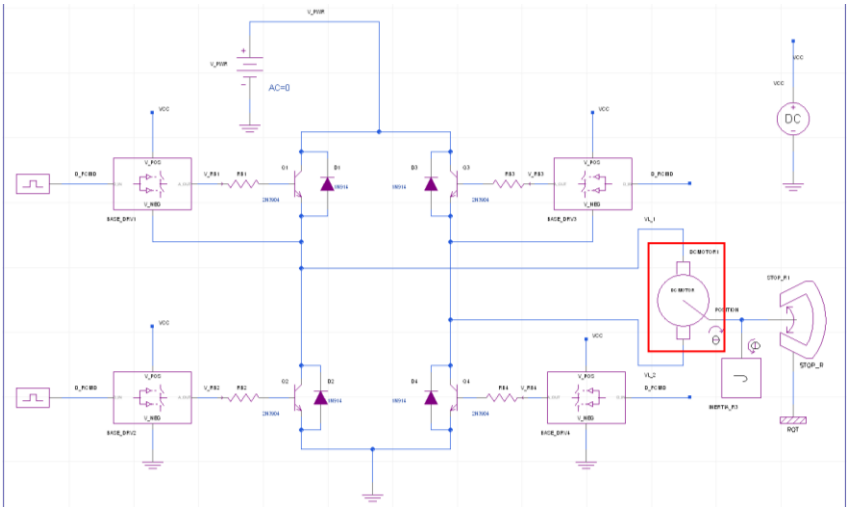
Description

Monte Carlo (MC) Analysis is a statistical analysis method that randomly varies model parameters within a specified tolerance range and distribution. A Monte Carlo Analysis is often used to help determine the "manufacturability" of a design, that is, given the tolerances used, how robust the design is when manufactured in large quantities.

Exercise 1: Setup Parameter Distribution

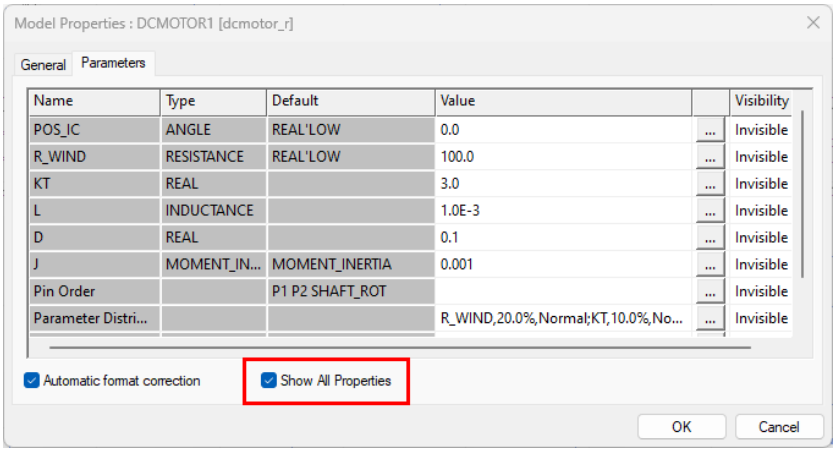
It is important to include the values and tolerances that will be used in the simulation. Downloading and installing Xpedition and Xpedition AMS will include the files mentioned below. However, they are also included in the Support Kit for download.

1. From within Xpedition AMS, load the project:
    a. Select **File > Open > Project** and navigate to C\MentorGraphics\EEVX.2.14\SDD_HOME\sim\systemvision\tutor\Beyond_Spice\Beyond_Spice.prj
    b. Select the *Beyond_Spice.prj* file
        i. Click *Yes* if asked to close any open documents
2. In the schematic, right click on the "DCMOTOR1" symbol and select *Edit Model Properties*



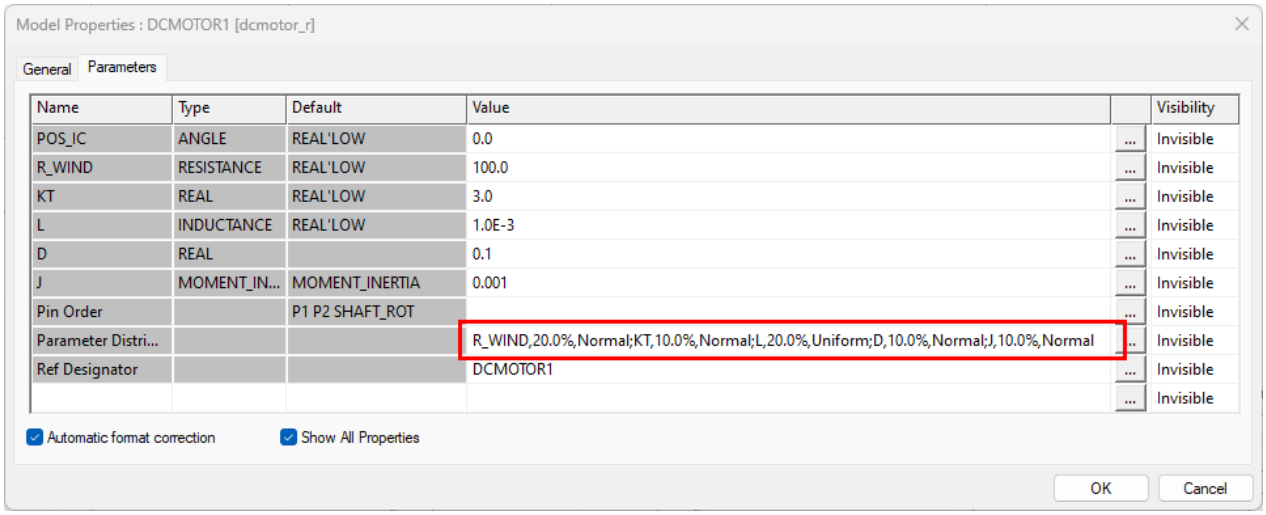
3. In the *Model Properties* dialog box, select the “Parameters” tab

4. Check the “Show All Properties” box



5. A new property will appear “Parameters Distribution” In the *Model Properties* dialog, confirm it has the following values:
R_WIND,20.0%,Normal; KT,10.0%,Normal; L,20.0%,Uniform; D,10.0%,Normal; J,10.0%,Normal

   Note: You can experiment and change the “Parameters Distribution” values to find different results.



   Note: Most of the motor parameters are specified with distribution information (this information can be specified by clicking on the button with the three dots […] next to the desired parameter).

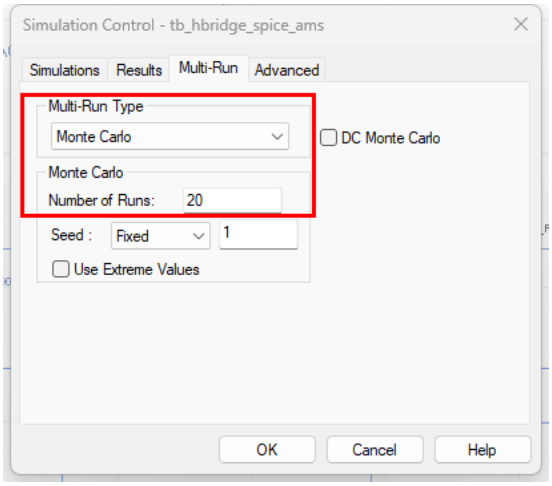
6. Select *OK*

Exercise 2: Run the Monte Carlo Simulation

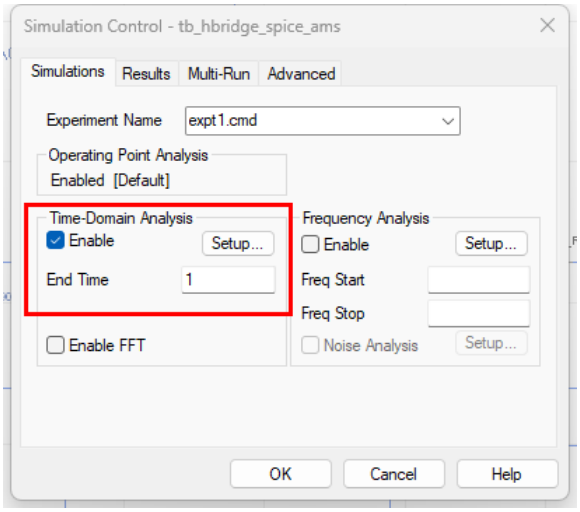
With the parameters assigned, the next step is to run the analysis.

The Monte Carlo Analysis is run in combination with one of the main analysis types (time or frequency domain) and the controls are built into the *Multi-Run* tab of the *Simulation Control* dialog.

1. Go to **Simulation > Simulate**
2. Select the *Multi-Run* tab
3. Change the *Multi-Run* Type to “Monte Carlo”
4. Set the *Number of Runs* to “20”



5. Select the *Simulations* tab and verify that *Time-Domain Analysis* is enabled with *End Time* set to “*1”*

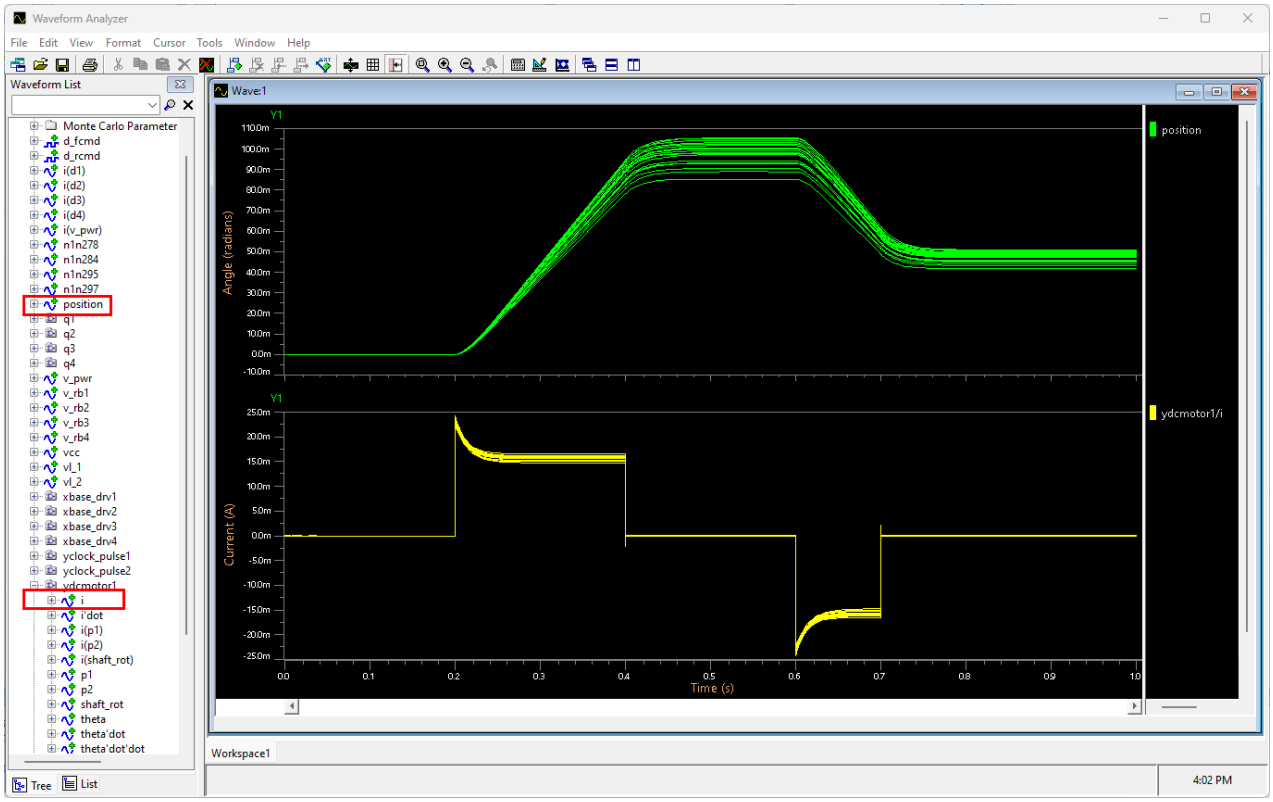


6. Click “OK” to run the simulation. The *Waveform Analyzer* will popup after the simulation is complete

   Note: Running the simulation may take a few minutes - monitor the progress by observing the lower left-hand corner of the Xpedition AMS window.

Exercise 3: Plot the Simulation Results

1. In the *Waveform Analyzer* window, right click *position* and select “Plot”. Do the same for *ydcmotor1/i*



   Note: Notice that the motor position and current both exhibit some variation and are displayed as compound waveforms. Each member of the family of curves represents one of the Monte Carlo simulation runs.

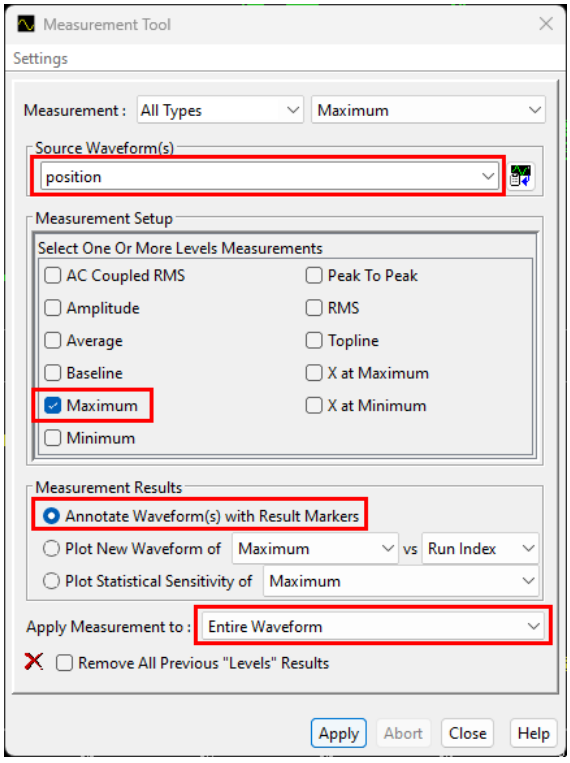
2. Select **Tools** > **Measurement Tool** to begin performing measurements

3. Select the “position” waveform using the drop-down list from the *Source Waveform(s)* field

4. Select “Maximum” as the *Measurement Setup*

5. Select “Annotate Waveform(s) with Result Markers” in the *Measurement Results* field

6. Select “Entire Waveform” in the *Apply Measurement to:* field – then click “Apply” and “Close”



7. Right click the measurement marker and select “Measurement Result” Now you can select whichever measurement you want to see, from the table shown