Auto-Measurement by MPI Probe Station with SENTIO® Software Suite in BSIMProPlus™

BSIMProPlus™ can control MPI semi-auto probe station (e.g. TS3000-SE) with SENTIO® software suite V2.8.0 to measure device IV and CV curves automatically. Please refer to the related NoiseProPlus™ application note for auto noise measurement using MPI probe station. This application note describes the auto measurement procedure assuming probe station is communication ready after loading wafer and wafer map. The following general steps are followed in a typical IV/CV measurement setup.

Define the Measurement Conditions

In order to start the measurements, user needs to define the correct measurement conditions. Launch BSIMProPlus™ and select the desired model by selecting **Model → Set Active Model** then add a new object in the object window below as shown in fig. 1(a) and 1(b) below.

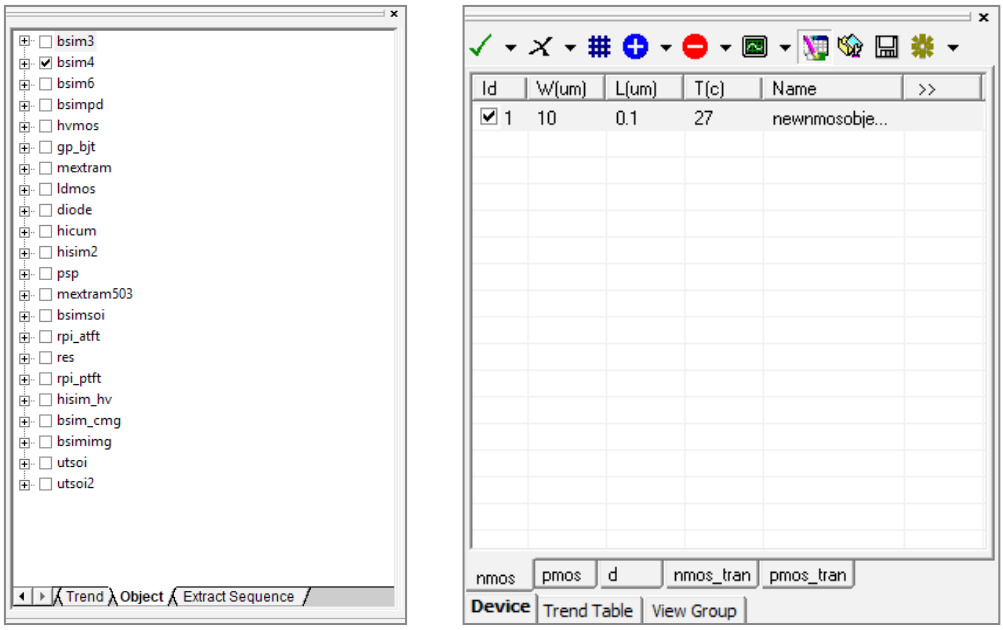

Figure 1(a). Select Active model (b) Define a new object

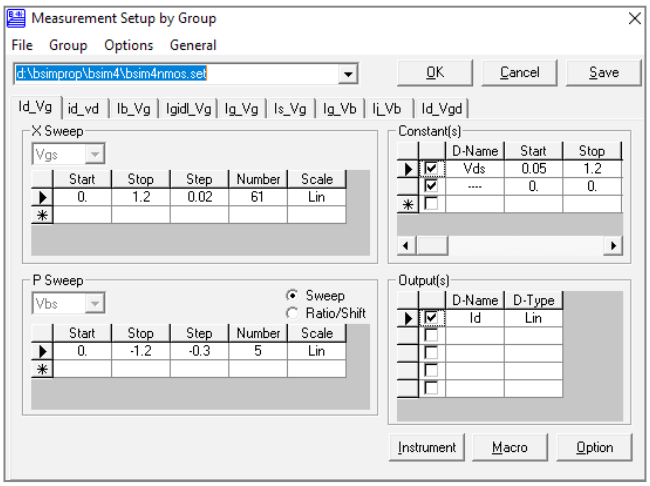

Figure 2. Measurement setup window

User can then edit the instance properties such as W, L, T in the **Device description window** and add multiple devices of the same or different types. In this application note, we choose single 10 x 0.1 nmos device IV using BSIM4 model for 5 dies across the wafer. Select this object and then click on the drop down menu of **Measurement** icon → **Setup** in the device description window and **Measurement setup** window pops up with default setup file loaded as shown in fig 2. below. Now define your own measurement conditions by clicking on each **Sweeps** (setup) and **Groups** (tabs).

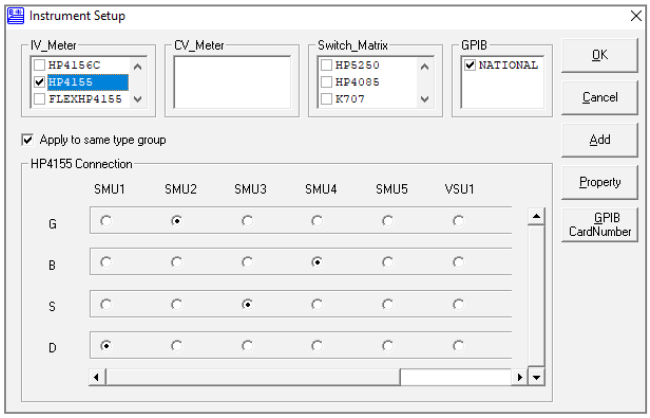

Figure 3. Instrument setup window

Select appropriate IV/CV equipment and input correct GPIB addresses and SMU connections as shown in fig. 3 above by clicking on **Instrument** box. User should always check and set appropriate compliance settings for each SMU by clicking on **Property → Channel Property** for each IV/CV meter as shown in fig. 4 below. Once setup configuration is complete, user must save the new setup file with a different filename than default at any desired location.

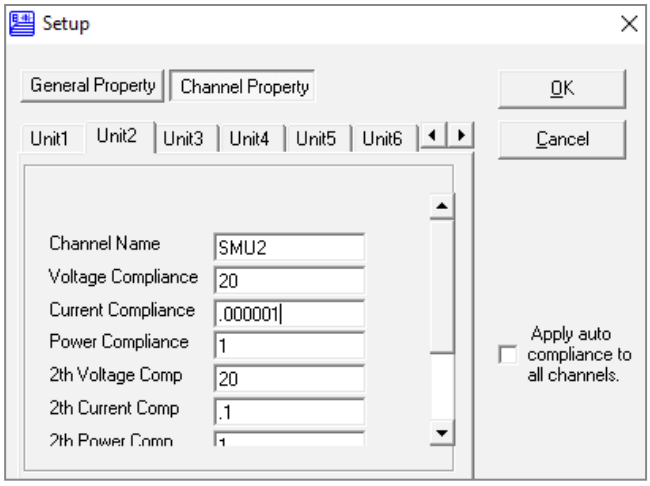

Figure 4. Channel property window for an IV meter

Auto Measurement Setting

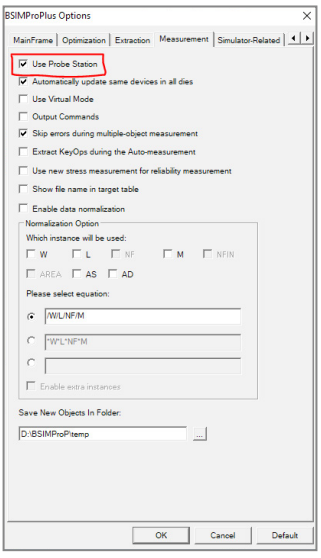

Figure 5. Auto measurement option to enable Probe station control

To enable auto measurements, user must enable the use of a probe station in the **Options** window. Go to **Tools → Options → Measurement** and select **Use Probe Station** as shown in fig. 5 below.

Choose Probe

After enabling the **Use probe station** option, you will see **Setup** option available under **Tools → DC measurements**. Click on **Setup → Choose Probe** to launch the prober setup window as shown in fig. 6 below. In order to use SENTIO® Software suite, user must select **MPI (GPIB)** option under **Prober Model**, also known as emulator mode. Note there is no need to specify the MPI Prober Driver Path (grayed out) when controlling the probe station in emulator mode. It is also important to note that SENTIO® software suite is capable of interpreting Cascade Nucleus commands. Set the correct **GPIB address** and make sure **Die** row is mapped to **Auto** control mode to enable die-to-die stepping. Configure rest of the default prober settings and click **OK**.

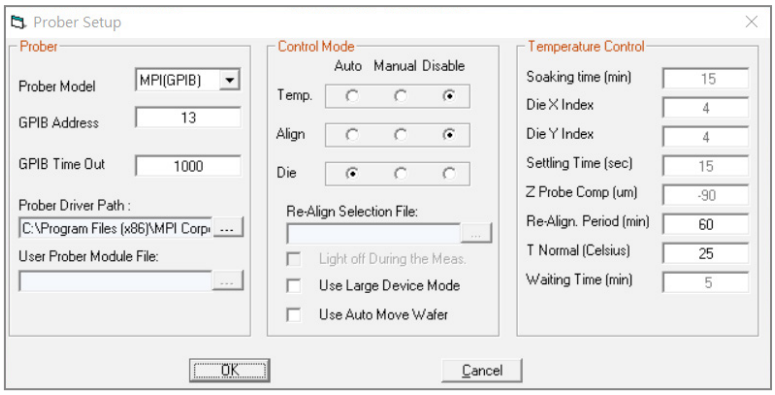

Figure 6. Prober setup window in BSIMProPlus™

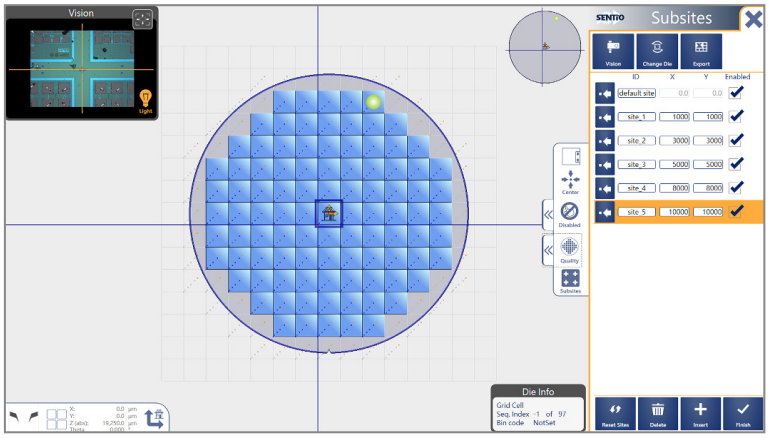

Figure 7. SENTIO® software suite: Wafer map setup (GPIB)

Load Probe Plan

Load the probe plan (or wafer map) in SENTIO® as shown in fig. 7 above. User may manually select the dies to be tested and export the wafer map to the desktop or import an existing wafer map file with a .trex extension. In BSIMProPlus™, click on **Tools → DC Measurement → Setup → Load Probe Plan** to launch the prober plan setup window as shown in fig. 8 below. Next browse for the **Probe Plan file** copied from the probe station computer to the location accessible by the BSIMProPlus™ if SENTIO® and BSIMProPlus™ are installed on different machines. User may also define lot and wafer names for the current device and select/de-select other options. BSIMProPlus™ automatically saves the measurement data to a default temp path which can be edited by the user to point to a specific location. Die information can be embedded in the saved data filename by checking the **Add and update die site XY to data filename** box. Once the wafer map setup configuration is complete, hit **OK**. This step may take some time as you follow the messages in the log window.

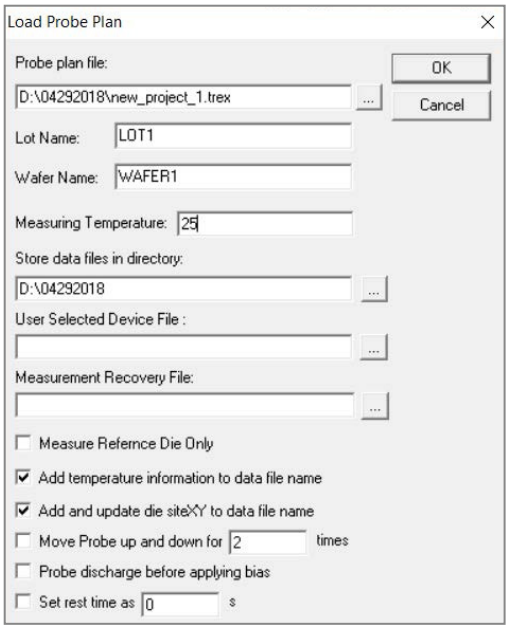

Figure 8. Probe plan window in BSIMProPlus™

Define Devices

Next step is to define devices to be measured in each die/sub-die. Go to **Tools → DC Measurement → Setup → Define Devices**. Note this option is available to user only when the previous **Probe Plan** setup has been successfully loaded. This will launch the **Define Devices** window as shown in fig. 9 below. Individual devices to be measured must be defined here for each sub-site along with their model, device type, terminal information, geometry etc. by clicking on the **Add** button. You also need to locate the **Setup file name** created and saved in step 1 above and hit **OK**. This will create corresponding device objects in the object window similar to step 1 and a blank data window appears on the right. User may further edit or customize instance parameters and setup file by once again clicking on **Measurement** icon **→ Setup**.

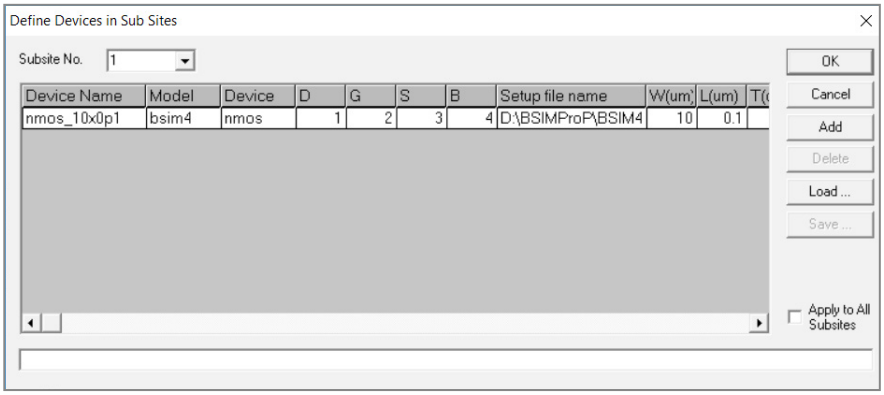

Figure 9. Device setup window in BSIMProPlus™

Start Auto Measurements

To start automatic measurements, click on **Tools → DC measurements → Measure**. This will create datasets under the device object corresponding to each die. User may visualize the plots as they keep coming in real-time and single die (or sub-die) datasets will then be available for browsing at the store data location. In the end, BSIMProPlus™ pops-out a log window indicating the finish of the auto-measurements and another .log file is created which contains detailed auto measurement report at the store data location shown in fig. 8.

MPI Global Presence

Direct contact:
Asia region: ast-asia@mpi-corporation.com
EMEA region: ast-europe@mpi-corporation.com
America region: ast-americas@mpi-corporation.com

MPI global presence: for your local support, please find the right contact here:
www.mpi-corporation.com/ast/support/local-support-worldwide