

Virtuoso 23.1

Module 11 – Quantus (PVS) Parasitic Extraction

American University of Beirut (AUB)
Lebanon

Content

Quantus (PVS) Parasitic Extraction

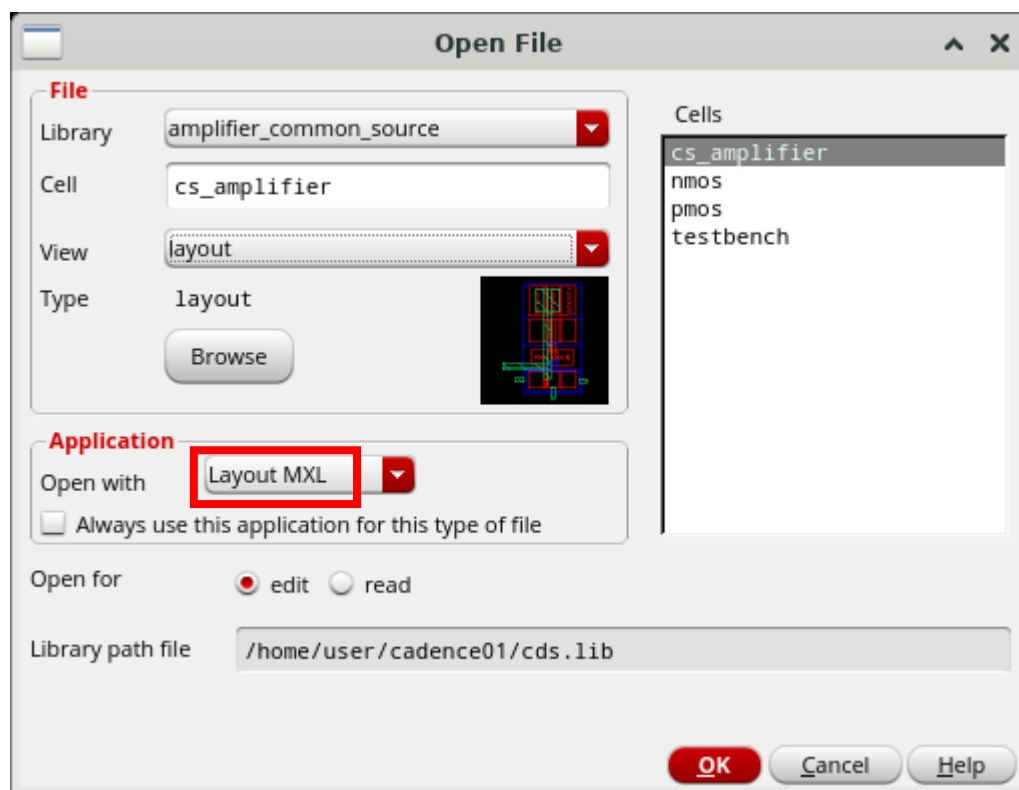
Module Objective

In this module, we will run the Quantus Physical Verification System (PVS) Parasitic Extraction. When the extraction is done, we can view the parasitics clearly on the layout.

Quantus (PVS) Parasitic Extraction

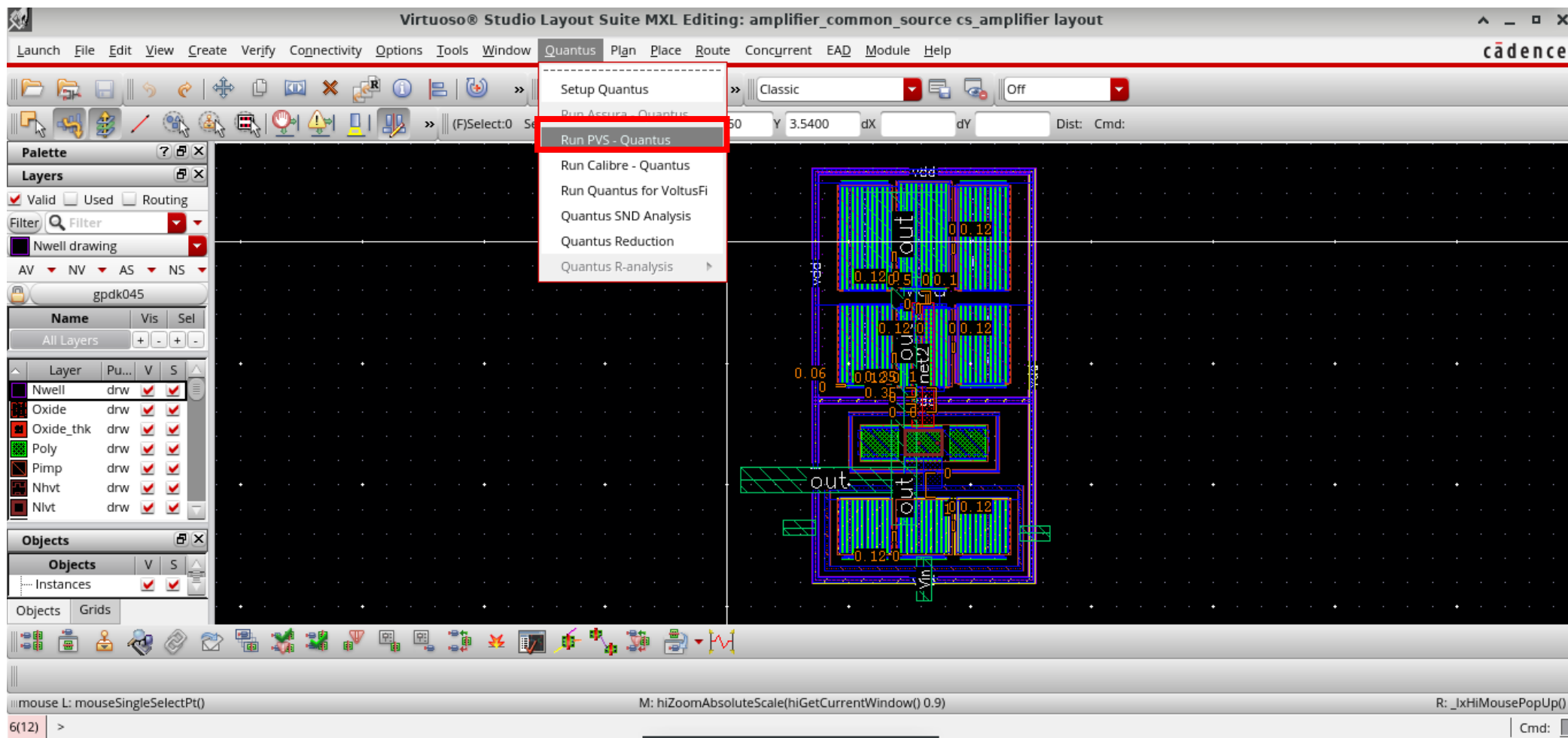
Quantus (PVS) Parasitic Extraction

- To study the behavior of the CS Amplifier circuit as a real design, we must extract the parasitics induced by the routing and the placement of the devices.
- QRC will generate, based on the log files of LVS, an **extracted view**, where we will be able to re-simulate the transient and AC analysis and compare the results.
- First open the layout view with Layout MXL.



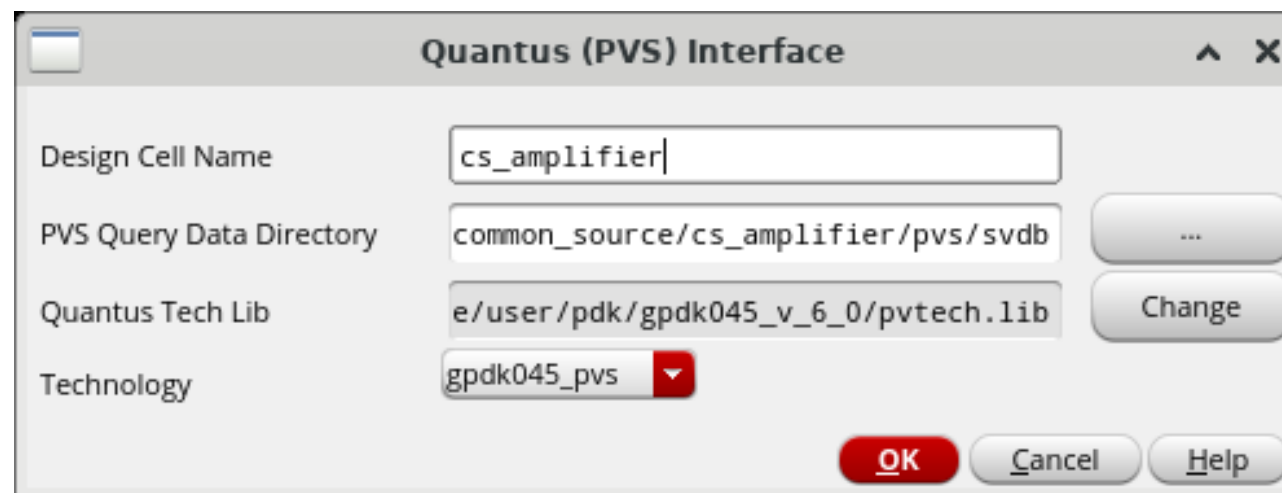
Quantus (PVS) Parasitic Extraction

- From the toolbar, select Quantus → Run PVS - Quantus.



Quantus (PVS) Parasitic Extraction

- The **Quantus (PVS) Interface** window pops-up.
- **Make sure the Cell Name is set to “cs_amplifier”**
- **Make sure Data Directory points to the folder “svdb” created by the LVS Run.** If not, click on ... => amplifier_common_source => cs_amplifier => pvs => click on svdb and on OK.
- **Make sure the Tech Lib points to pvtech.lib.**
- Click OK to proceed.

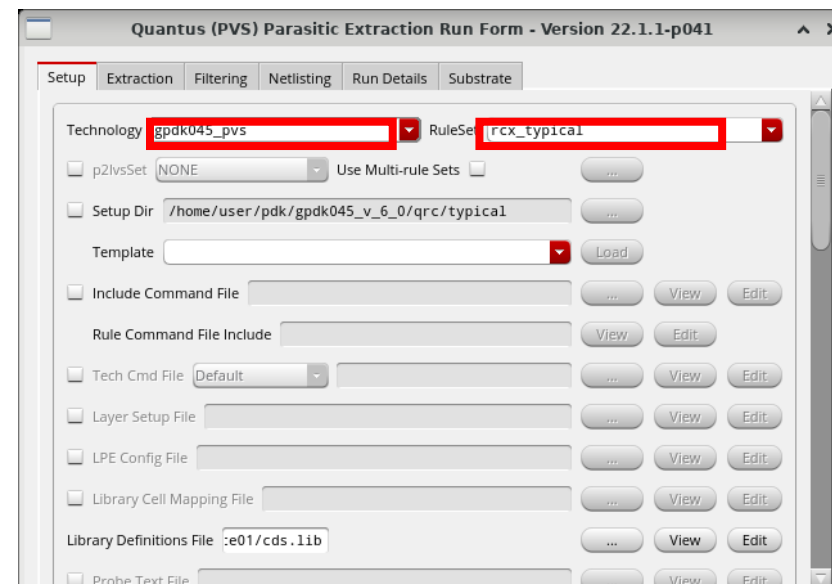


- It is important that the Directory points to the “svdb” folder created by the LVS Run, otherwise the tool would display an error when running QRC.
- Rule Set: LVS extraction and comparison rules used in the LVS run and needed for Quantus run.

Quantus (PVS) Parasitic Extraction *(continued)*

➤ Setup

- Select the Technology **gpdk045_pvs**.
- Select **rcx_typical** for the RuleSet.
- Output:
 - Extracted View
 - Lib: **amplifier_common_source**
 - Cell: **cs_amplifier**
 - View: **av_extracted**
- Disable the CellView Check.
- **Disable the Auto Accuracy Downgrade** (located at the lower half of the form).



Quantus (PVS) Parasitic Extraction Run Form - Version 22.1.1-p041

Setup Extraction Filtering Netlisting Run Details Substrate

Technology: **gpdk045_pvs** RuleSet: **rcx_typical**

☐ p2lvsSet: NONE Use Multi-rule Sets ☐

☐ Setup Dir: /home/user/pdk/gpdk045_v_6_0/qrc/typical

Template: Load

☐ Include Command File View Edit

Rule Command File Include View Edit

☐ Tech Cmd File: Default View Edit

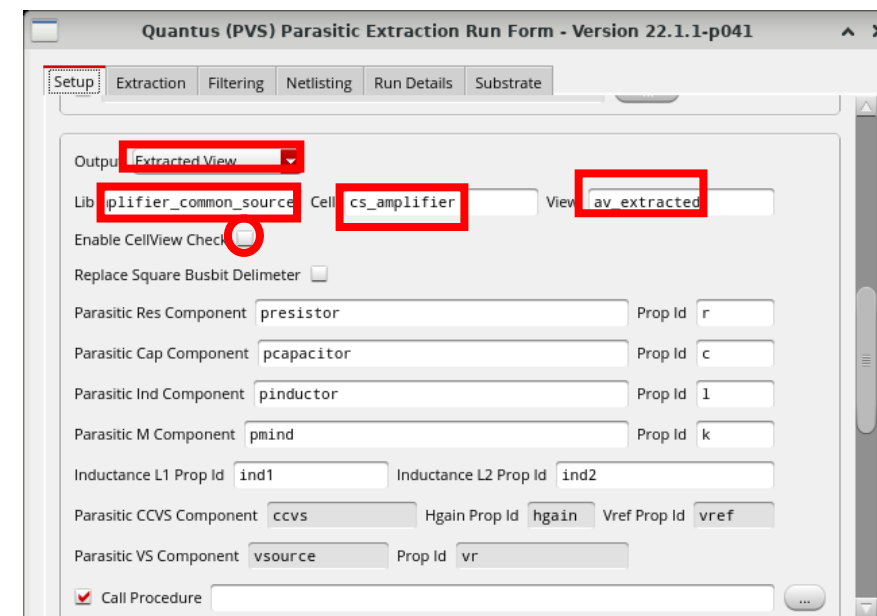
☐ Layer Setup File View Edit

☐ LPE Config File View Edit

☐ Library Cell Mapping File View Edit

Library Definitions File: e01/cds.lib View Edit

☐ Probe Text File View Edit



Quantus (PVS) Parasitic Extraction Run Form - Version 22.1.1-p041

Setup Extraction Filtering Netlisting Run Details Substrate

Output: **Extracted View**

Lib: **amplifier_common_source** Cell: **cs_amplifier** View: **av_extracted**

Enable CellView Check ☐

Replace Square Busbit Delimiter ☐

Parasitic Res Component: presistor Prop Id: r

Parasitic Cap Component: pcapacitor Prop Id: c

Parasitic Ind Component: pinductor Prop Id: l

Parasitic M Component: pmind Prop Id: k

Inductance L1 Prop Id: ind1 Inductance L2 Prop Id: ind2

Parasitic CCVS Component: ccvs Hgain Prop Id: hgain Vref Prop Id: vref

Parasitic VS Component: vsource Prop Id: vr

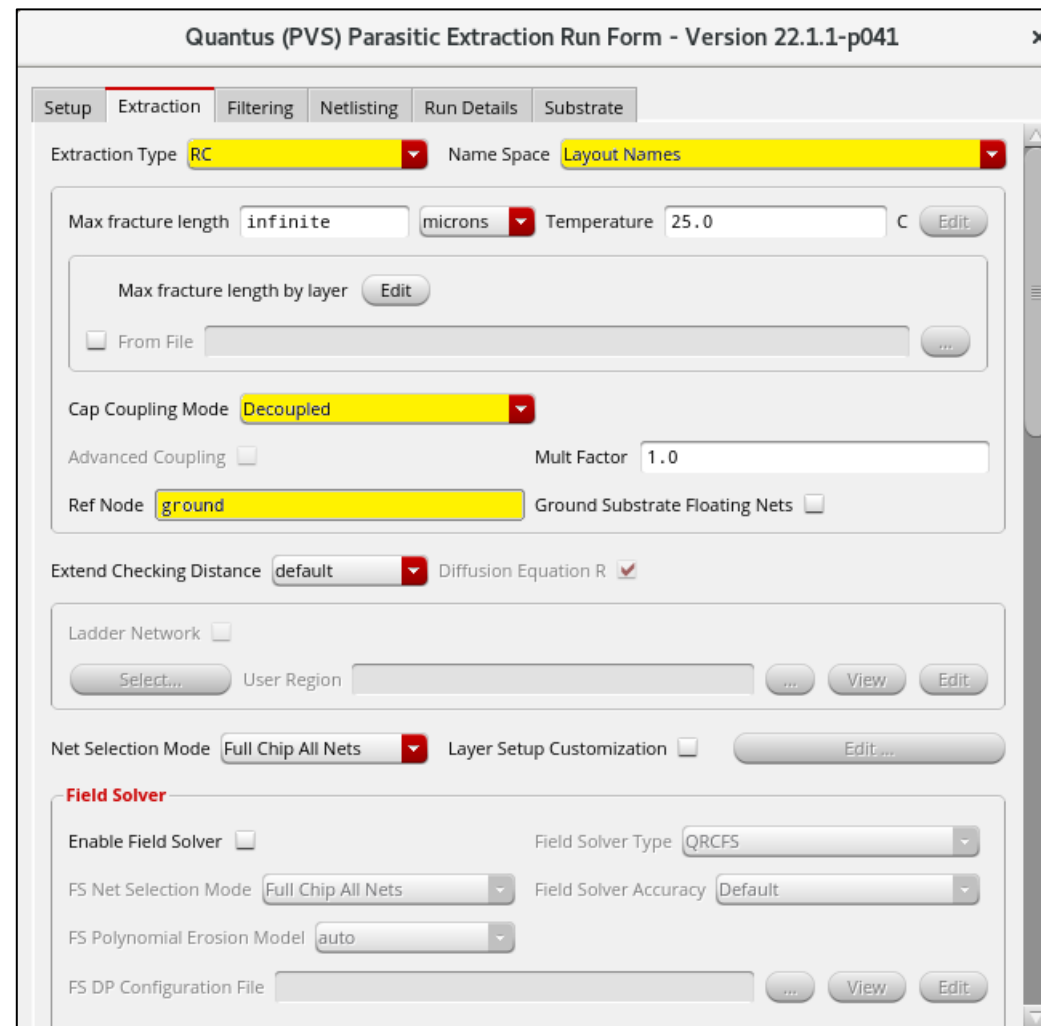
☒ Call Procedure

- The Setup Directory is set by default. The path to “../qrc/typical” might be different on your machine; however, it is found under the folder “pdk”.

Quantus (PVS) Parasitic Extraction (*continued*)

➤ Extraction

- Set the Extraction Type to **RC**.
- Set the Cap Coupling Mode to **Decoupled**.
- Set the Ref Node to **ground**.
- Make sure the Name Space is set to **Layout Names**.

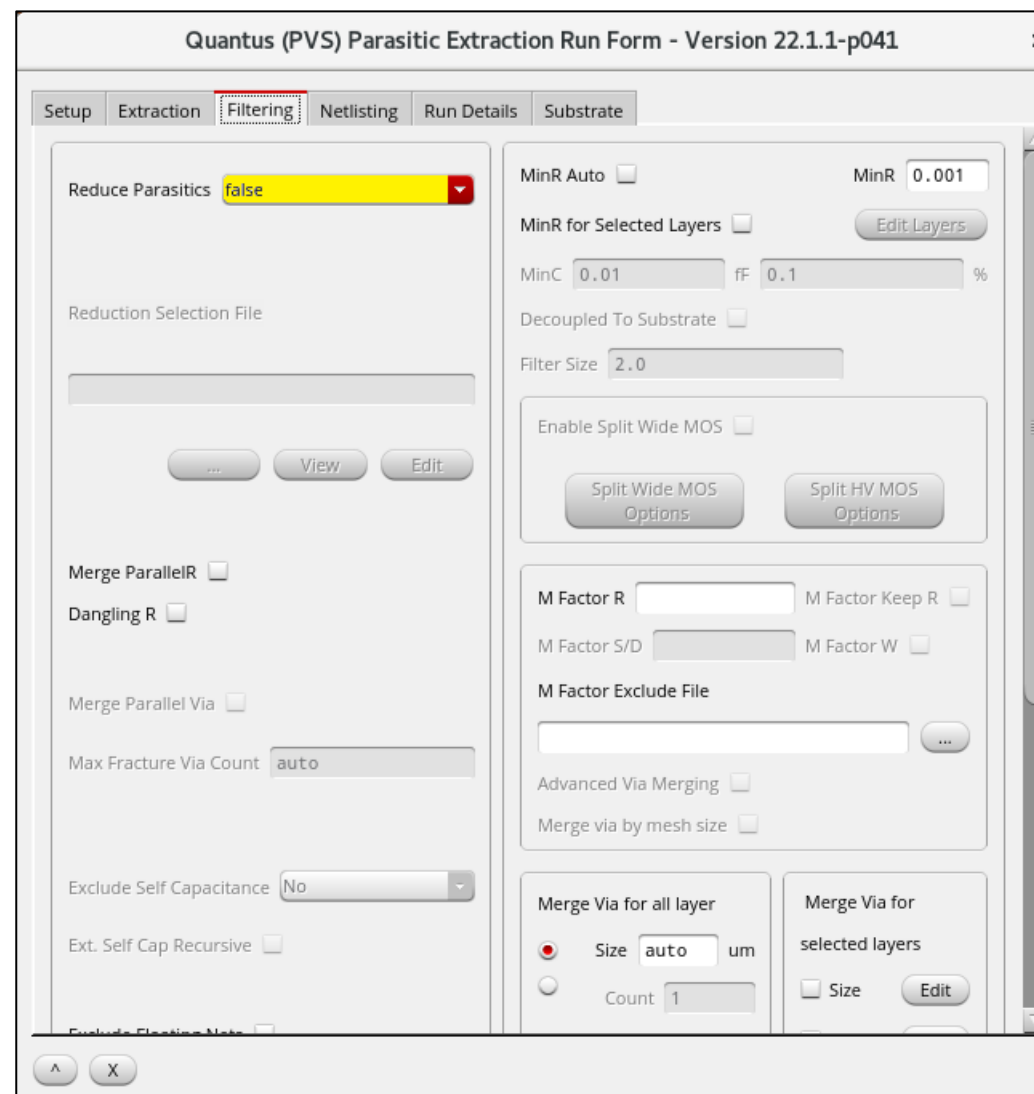


The image shows the 'Quantus (PVS) Parasitic Extraction Run Form - Version 22.1.1-p041' window. The 'Extraction' tab is selected. The 'Extraction Type' is set to 'RC' and the 'Name Space' is set to 'Layout Names'. The 'Max fracture length' is set to 'infinite' and the 'Temperature' is set to '25.0'. The 'Cap Coupling Mode' is set to 'Decoupled'. The 'Ref Node' is set to 'ground'. The 'Extend Checking Distance' is set to 'default' and the 'Diffusion Equation R' checkbox is checked. The 'Field Solver' section is expanded, showing 'Enable Field Solver' checked, 'Field Solver Type' set to 'QRCFS', 'FS Net Selection Mode' set to 'Full Chip All Nets', 'Field Solver Accuracy' set to 'Default', and 'FS Polynomial Erosion Model' set to 'auto'.

Quantus (PVS) Parasitic Extraction (*continued*)

➤ Filtering

- Make sure the Reduce Parasitics is set to **false**.

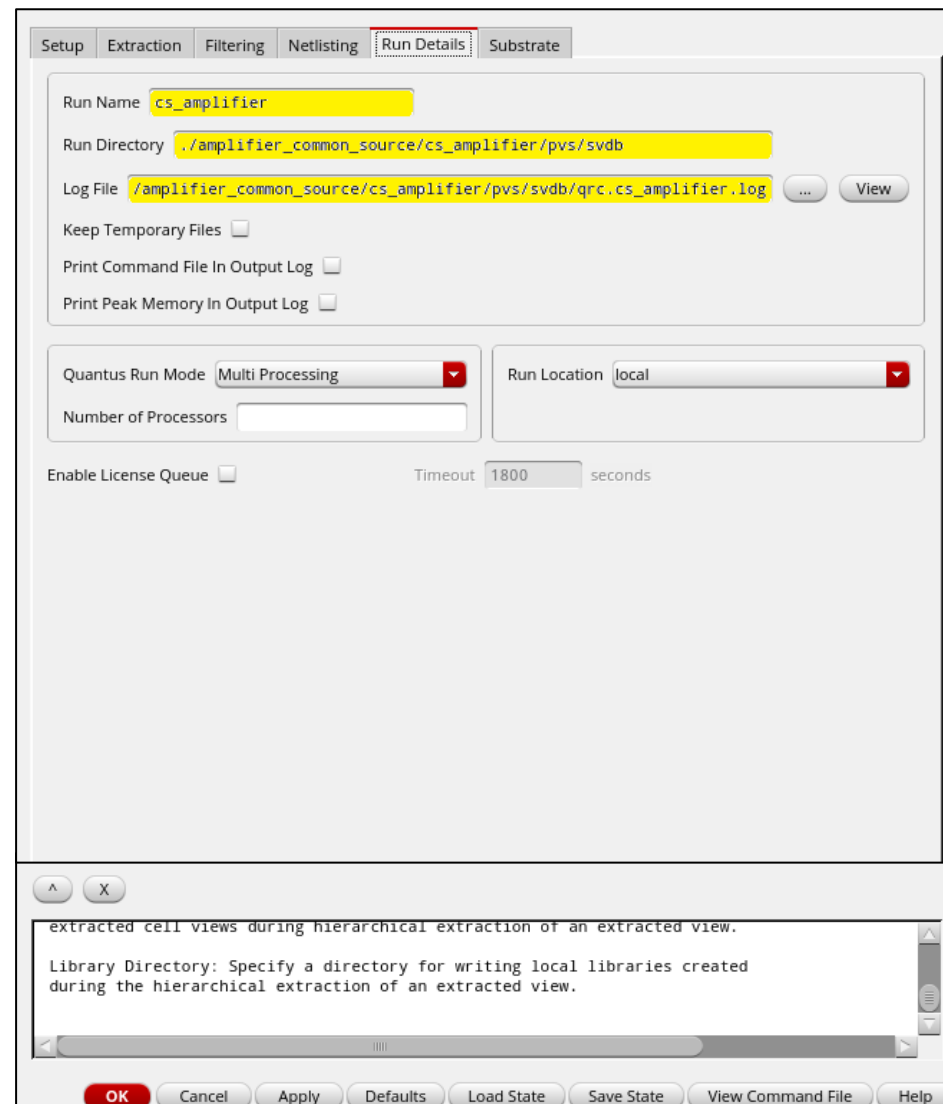


The image shows the 'Quantus (PVS) Parasitic Extraction Run Form - Version 22.1.1-p041' window. The 'Filtering' tab is selected. The 'Reduce Parasitics' dropdown is set to 'false'. The 'Reduction Selection File' field is empty. The 'Merge Parallel R' checkbox is unchecked. The 'Dangling R' checkbox is unchecked. The 'Merge Parallel Via' checkbox is unchecked. The 'Max Fracture Via Count' is set to 'auto'. The 'Exclude Self Capacitance' dropdown is set to 'No'. The 'Ext. Self Cap Recursive' checkbox is unchecked. The 'MinR Auto' checkbox is unchecked. The 'MinR' value is 0.001. The 'MinR for Selected Layers' checkbox is unchecked. The 'MinC' value is 0.01. The 'ff' value is 0.1. The 'Decoupled To Substrate' checkbox is unchecked. The 'Filter Size' is 2.0. The 'Enable Split Wide MOS' checkbox is unchecked. The 'Split Wide MOS Options' button is visible. The 'Split HV MOS Options' button is visible. The 'M Factor R' field is empty. The 'M Factor Keep R' checkbox is unchecked. The 'M Factor S/D' field is empty. The 'M Factor W' checkbox is unchecked. The 'M Factor Exclude File' field is empty. The 'Advanced Via Merging' checkbox is unchecked. The 'Merge via by mesh size' checkbox is unchecked. The 'Merge Via for all layer' radio button is selected. The 'Size' is set to 'auto' um. The 'Count' is 1. The 'Merge Via for selected layers' radio button is unselected. The 'Size' checkbox is unchecked. The 'Edit' button is visible.

Quantus (PVS) Parasitic Extraction (*continued*)

➤ Run Details

- The **Run Name**, **Run Directory**, and **Log File** should be set by default.
- Click **OK** to start the extraction.

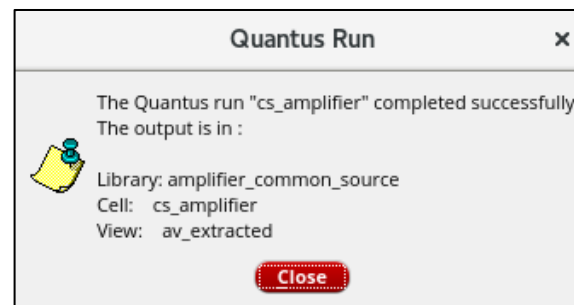
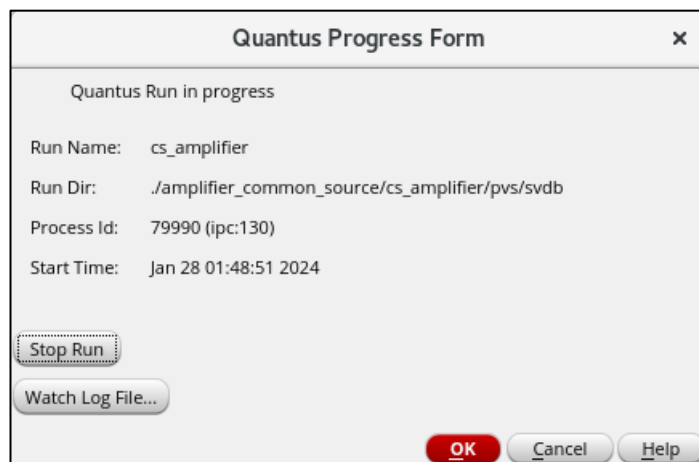


The image shows the 'Run Details' tab of the Quantus Parasitic Extraction dialog box. The 'Run Name' is 'cs_amplifier', 'Run Directory' is './amplifier_common_source/cs_amplifier/pvs/svdb', and 'Log File' is '/amplifier_common_source/cs_amplifier/pvs/svdb/qrc.cs_amplifier.log'. There are checkboxes for 'Keep Temporary Files', 'Print Command File In Output Log', and 'Print Peak Memory In Output Log'. The 'Quantus Run Mode' is set to 'Multi Processing' and 'Run Location' is 'local'. The 'Number of Processors' is empty. 'Enable License Queue' is unchecked and 'Timeout' is 1800 seconds. At the bottom, there is a text area with instructions: 'extracted cell views during hierarchical extraction of an extracted view. Library Directory: Specify a directory for writing local libraries created during the hierarchical extraction of an extracted view.' and buttons for 'OK', 'Cancel', 'Apply', 'Defaults', 'Load State', 'Save State', 'View Command File', and 'Help'.

- Make sure the Run Directory is set correctly, it has to point to the “svdb” folder created by the LVS Run.

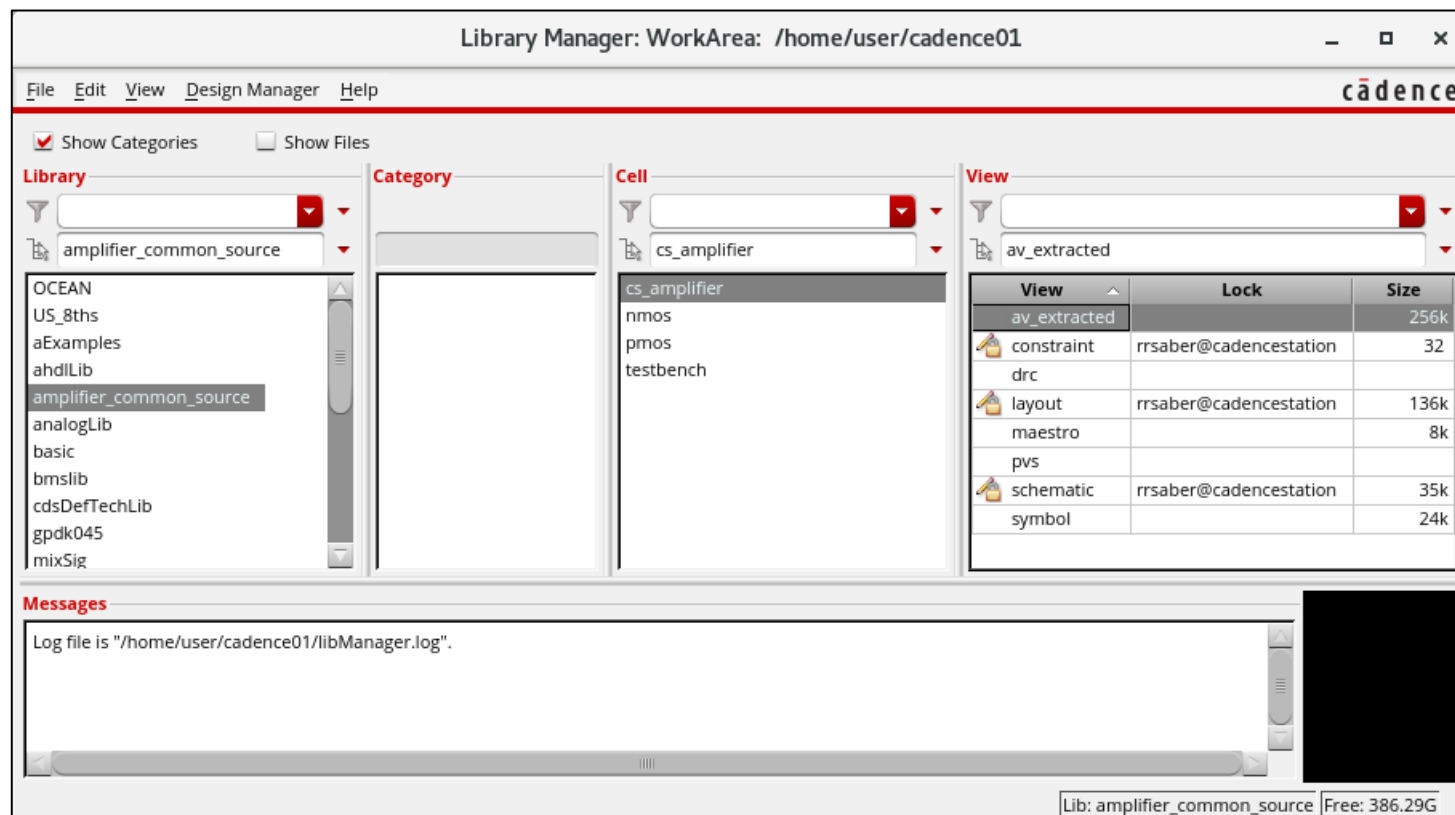
Quantus (PVS) Parasitic Extraction (*continued*)

- The Quantus Progress Form opens at the bottom right of your screen.
- You can check the Log File by clicking on Watch Log File.
- After a while, the extraction should be done and the **Quantus Run** window will pop-up.
- Click Close.



Quantus (PVS) Parasitic Extraction (*continued*)

- Open the Library Manager and a new **View** should be available under the library amplifier_common_source called **av_extracted**.
- The **av_extracted** view is the layout that contains the parasitics.



Quantus (PVS) Parasitic Extraction (*continued*)

- If the parasitics are not shown, press **Shift+F**.
- The extracted view is the layout design showing the small parasitics (RC) and the folded transistors on top of each other.
- By zooming in, it is possible to see the parasitics.

