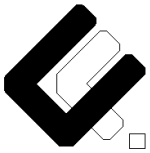
GDSXOR.tcl Tool Version 1.0



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1 Environment path :

You necessarily should have a version of Calibre defined in your environment.
Create a .ucdprod file in your current directory and add **TCL version 8.0.4.** and **MIF version 1.7.4.**

2 Purpose :

2.1 Layers definitions :

Primitive : the layer number and datatype in the GDS file, with a possible increment by LAYOUT BUMP2 value.
Simple : the layer number after LAYER MAP specification.
Original : One or more simple layers (ex.: LAYER M1 12 22).

2.2 XOR of layout databases :

This tool alows user to compare under calibre two input layout databases with GDSII format and supplies a third file with .gds or .db format in output. This is one possible use of dual database capability in Calibre DRC called layout-versus-layout (LVL). An exemple is given below.
To use two input layout databases, the following additional SVRF specification statements are required :

```
LAYOUT SYSTEM2 GDSII
LAYOUT PATH2 <file-name>
LAYOUT PRIMARY2 <cell-name>
LAYOUT BUMP2 <number>
```

The layer numbers of the layers in the second database are incremented by the layer bump value. The layer bump value must be larger than the highest specified simple layer number from database 1.

2.3 Layer number limits :

Calibre allows primitive layer numbers <= 8192. GDS only allows 64 layers.
But the firsts layers between 0 to 4000 are already used by calibre, thus it remains only about 4000 free layers.

LAYER MAP can create a new simple layer for a GDS (Layer, datatype) pair. For example
LAYER POLY 55
LAYER MAP 1000 DATATYPE 5 55
creates simple layer 55 from primitive GDS (layer, datatype) = (1000,5).

2.4 Calibre file example :

```
LAYOUT SYSTEM GDSII
LAYOUT PRIMARY gdsfile1.gds
LAYOUT PRIMARY Topcell1

LAYOUT SYSTEM2 GDSII
LAYOUT PRIMARY2 gdsfile2.gds
LAYOUT PRIMARY2 Topcell2          // could be topcell1 also
LAYOUT BUMP 100                   // map 2 -> 102, 45 -> 145

// database 1
LAYER DIFF 2 4000
LAYER MAP 2 DATATYPE == 0 4000

LAYER METAL1 45 3999
LAYER MAP 45 DATATYPE == 30 3999

// database 2
LAYER DIFF_2 102 2000
LAYER MAP 102 DATATYPE == 0 2000

LAYER METAL1 145 1999
LAYER MAP 145 DATATYPE == 30 1999

//operations
diff_1 { DIFF XOR DIFF_2 }
diff_2 { METAL1 XOR METAL1_2 }

//mapping
DRC CHECK MAP diff_1 2 0
DRC CHECK MAP diff_2 45 30
```

Flow chart :

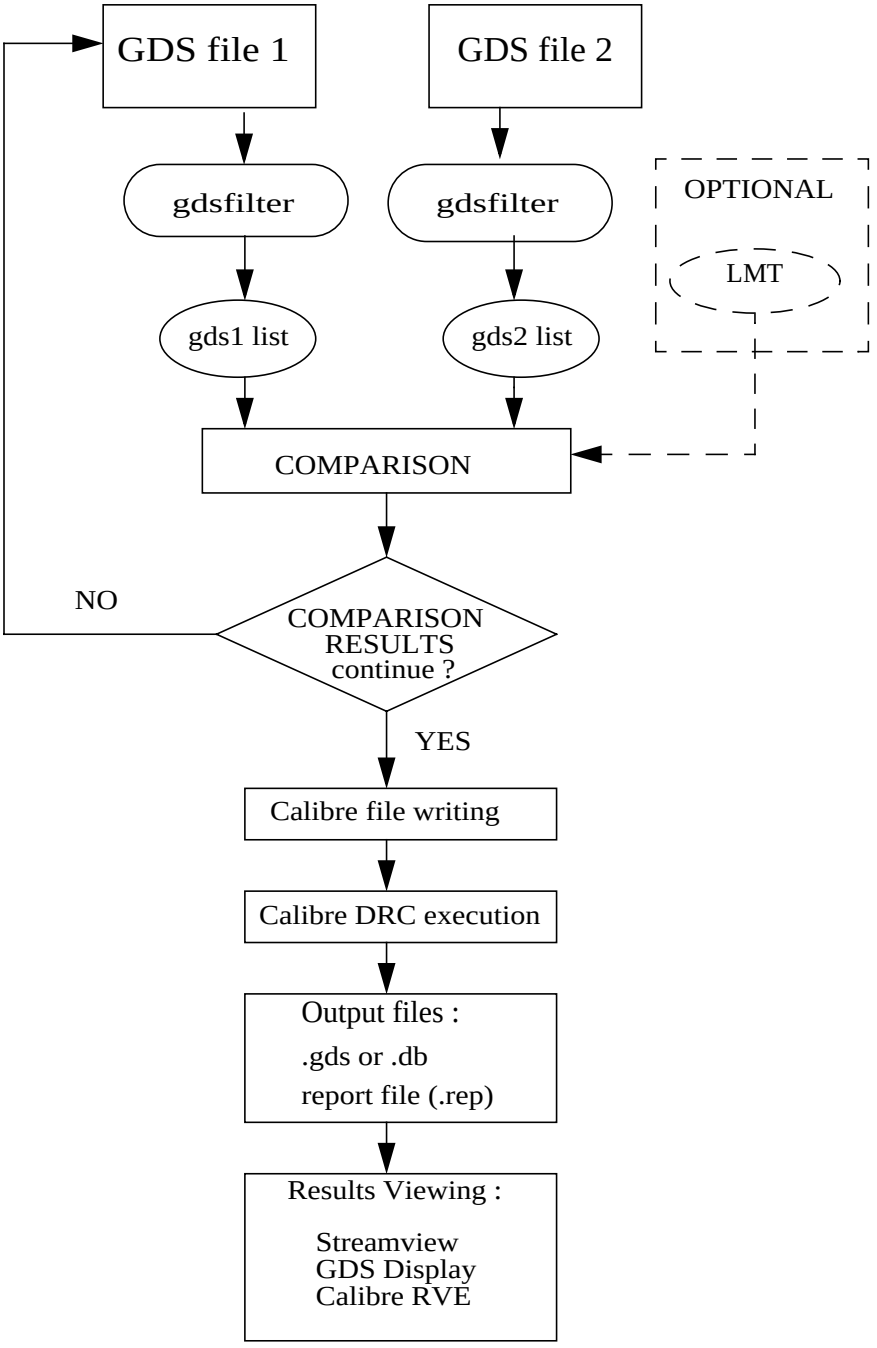


Table 1: GDSXOR program flowchart.

The GDSXOR tool firstly generates a such calibre file automatically. Secondly, calibre DRC is launched from the generated calibre file.

3 How to use GDSXOR.tcl tool :

3.1 GDSXOR by interface :

Syntax : prompt> dkGDSXOR.tcl -gui (and press ENTER)

3.1.1 The first interface : Data capture

GDS2 Files Comparison Interface (**Figure 1**) take in input the two GDS files and its corresponding topcell names that will be compared. The grid of used technologie is also requested.

From this interface you have the choice between two formats in output : .gds or .db. Moreover, you have the possibility to merge datatypes, to execute comparison layer by layer by giving a layers list and to use a LayerMapTable file. For example, by choosing "yes" to the Layer map table button, a new entry appears to specify the LayerMapTable as shown in **Figure 2**.

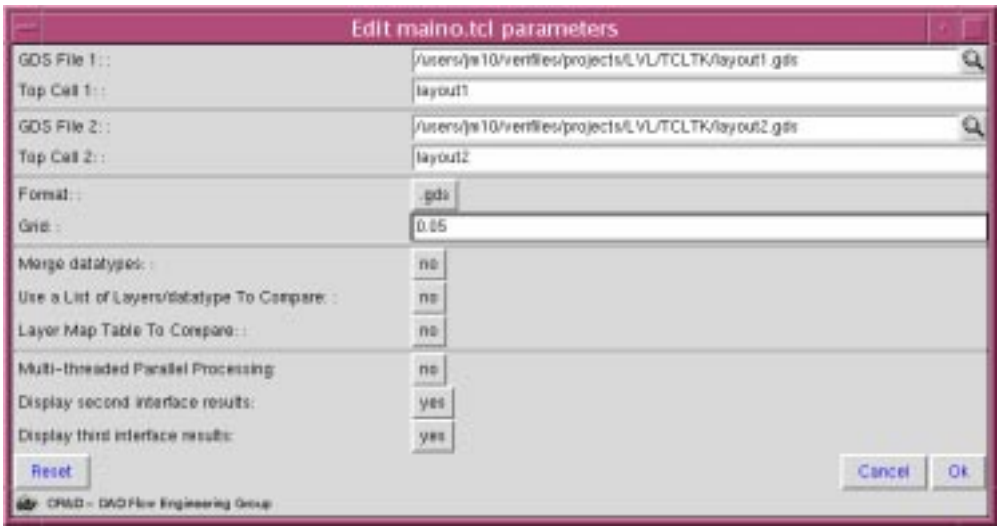


Figure 1: *The first interface which displays when you start GDSXOR.tcl.*

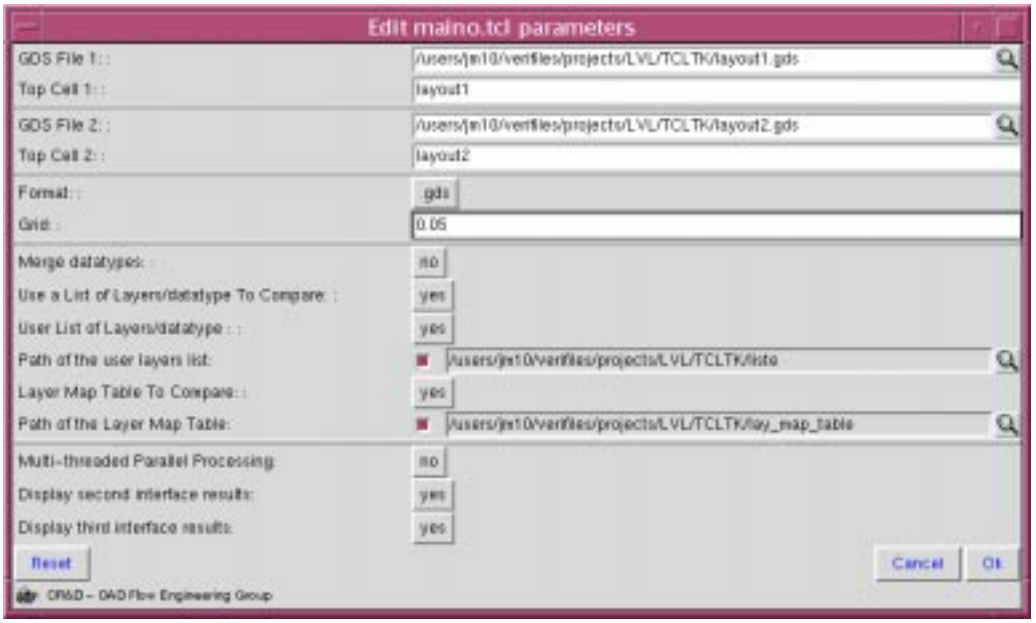


Figure 2: *The first interface which displays when you start GDSXOR.tcl* after choicing "yes" for different parameters.

- Switches description :

☞ **GDS file 1 :**

Enter the first gds file to compare

☞ **Top Cell 1 :**

Enter the topcell name of GDS file 1

☞ **GDS file 2 :**

Enter the second gds file to compare

☞ **Top Cell 2 :**

Enter the topcell name of GDS file 2

☞ **Format :**

You have the possibility to choice as output format either a .gds file, or a .db file.

☞ **Grid :**

Enter your grid according to your used technologie.

☞ **Merge datatype :**

Select "yes" if you want to merge datatypes.

☞ **Use list of layers/datatypes to compare :**

Select "yes" if you want to compare from a layers/datatypes list that either you import,

or you create later in the second interface.

☞ **User list of layers/datatypes :**

This switch only appears if the previous is enabled at "yes".
If you already have a list in a file, you can import that list and run the comparison from the couples layers/datatypes within the list. In that case, choose "yes". Otherwise, the second interface (if its value is "yes") will propose you to create interactively a list with the mouse.

☞ **Layer map table to compare :**

If you possess a layer map table, by selecting "yes" an entry appears to allow you to enter your path corresponding to your file.

☞ **Multi-threaded Parallel Processing :**

Choose "yes" to execute a multi-threaded parallel processing and enter the number of cpu in the entry which appears.

☞ **Dilsplay second interface results :**

When you press the OK button, GDSXOR.tcl tool begins its comparison between both GDSII files only on their content. After that first comparison, a second interface introduces you the results. From that interface, you can also create a list as mentioned befor.

☞ **Display third interface results :**

This last interface introduces all differences found by Calibre after comparing both GDS files with its XOR function. A save button, allows you to save your results. But, if you prefer to obtain your results as a file, choose "no" in that switch.

- Button functions :
-

OK : starts GDSII files comparison and gives a result interface.
Reset : erases all entries to allow a new capture.
Quit : Exit the GDS2 Files Comparison window.

3.1.2 The second interface : Comparison between gds files among themselves or with a Layer MapTable.

This interface may have several forms according to the first interface data and the GDSII files themselves.

- ❑ If list and LMT button have "no" value :

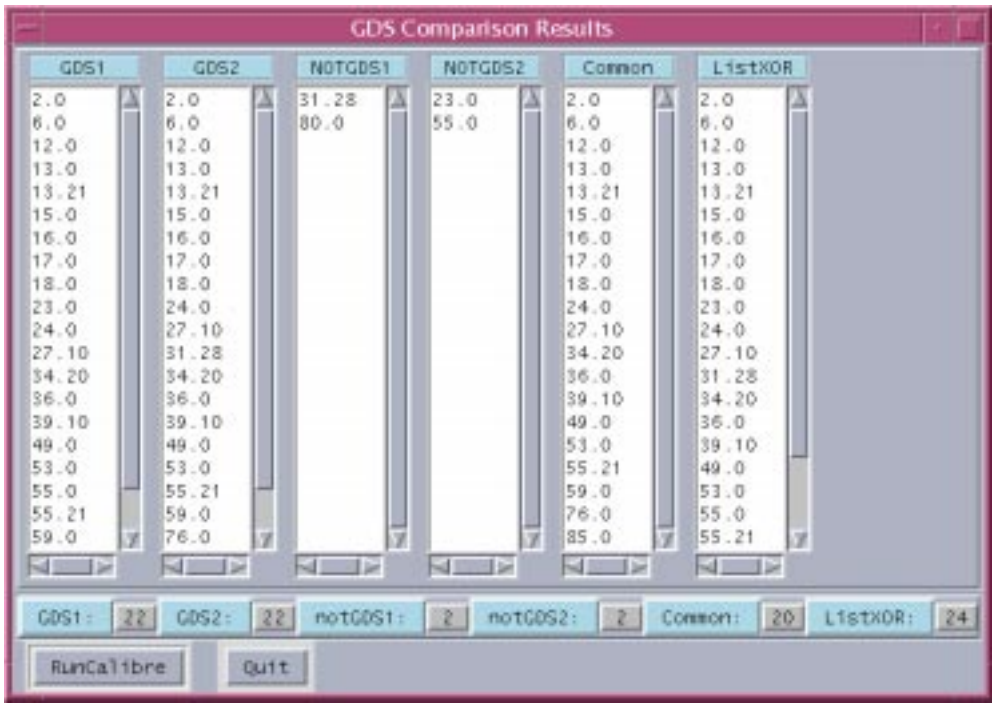


Figure 3: Second interface, which appears after clicking on compare button in the first interface, if list and LMT button have "no" value.

The interface of Figure 3 appears. It contains the extracted lists from GDSII files and their comparison.

❏ If list button is at "yes" and userlist at "no".

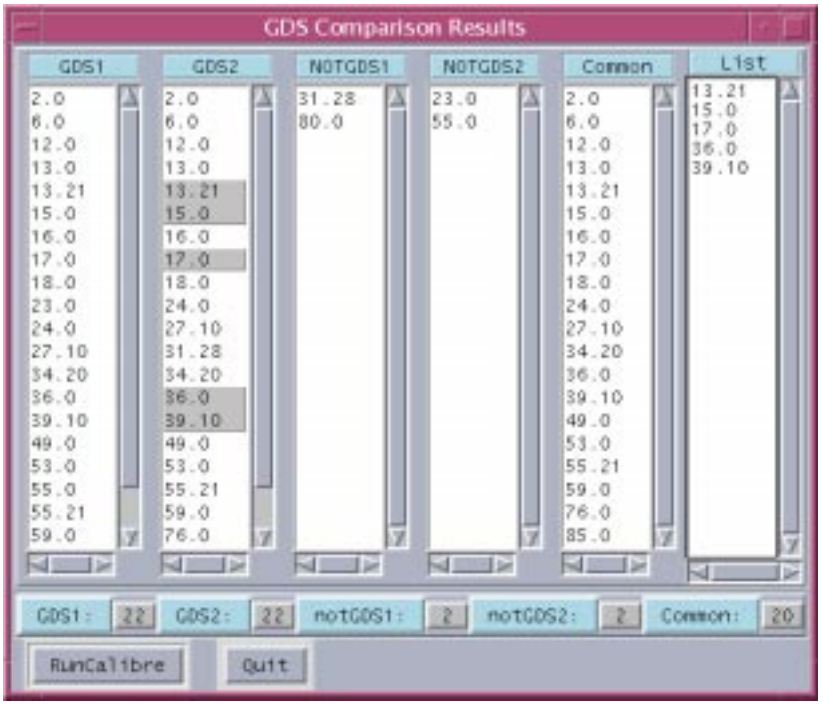


Figure 4: *Second interface, which appears after clicking on OK button in* the first interface, if list button is at "yes" and userlist at "no".

The list is initially empty. Then, you can choice no matter layer in other lists. To choice a full list ,just click on the button that corresponds to the list. The selected list will fill the empty list.

- If both list button and userlist button are at "yes" value.

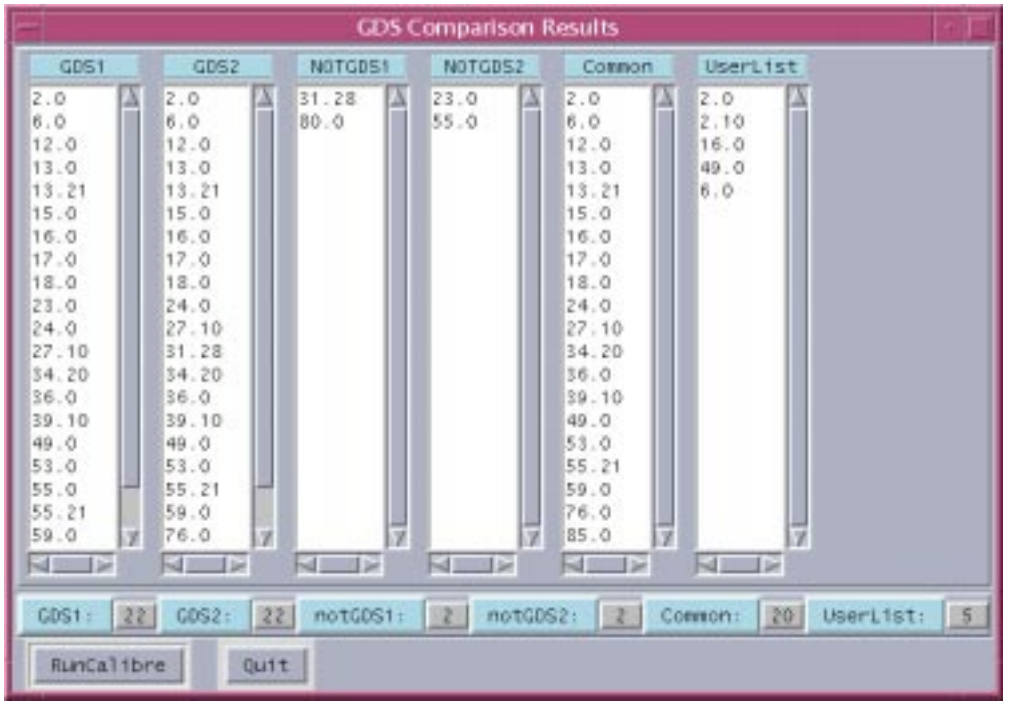
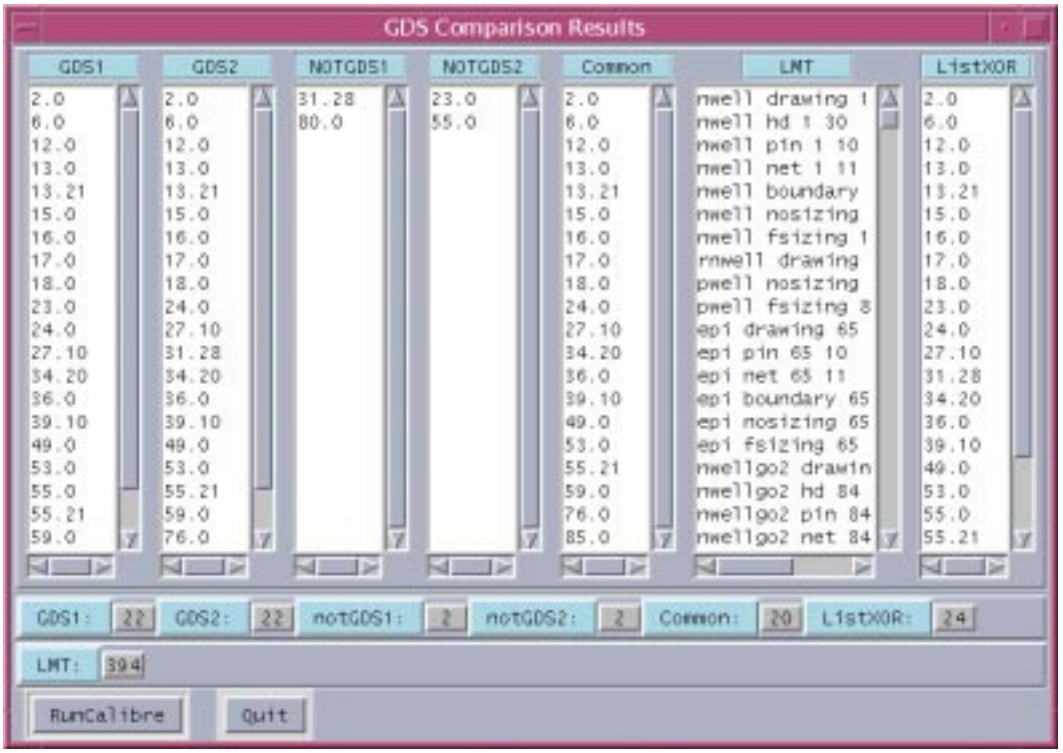


Figure 5: *Second interface, which appears after clicking on OK button in* the first interface, if list button is at "yes" and userlist at "yes".

- If LMT button is at "yes" value.



Second interface, which appears after clicking on OK button in the first interface, if LMT button is at "no" value.

❑ If GDS file 1 and GDS file 2 exactly have the same number of layers.

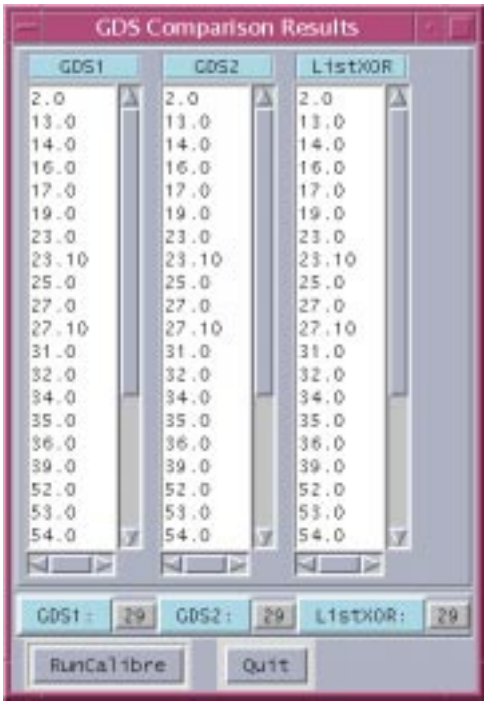


Figure 6: Second interface, which appears after clicking on compare button in the first interface, if GDS file 1 and GDS file exactly have the same number of layers.

❑ If some layers of input gds files aren't present in the LayerMapTable.

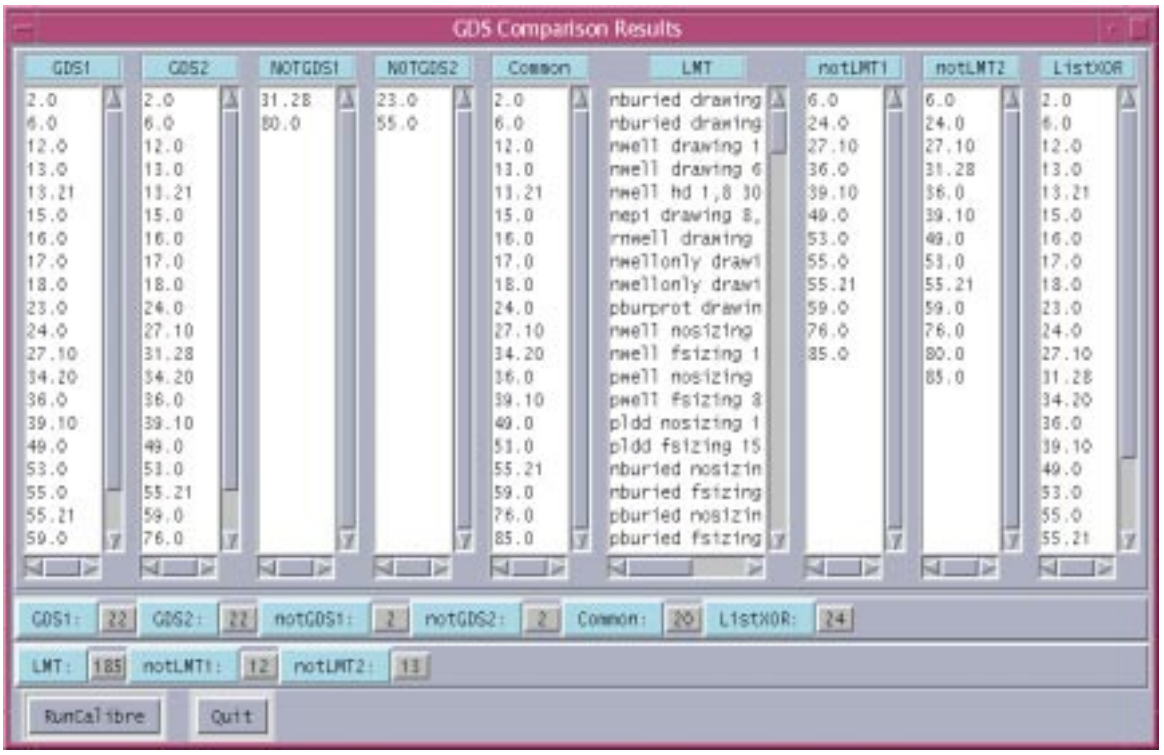


Figure 7: Second interface, which appears after clicking on compare button in the first interface, if some layers of input gds files aren't present in the LayerMapTable.

Moreover, two warning messages inform user that the LayerMapTable may be incorrect.

- Button functions :

GDS1 :, GDS2 :, etc : copy the selected list in the list named ListXOR or List.
RunCalibre : write the calibre file from ListXOR or List, run Calibre DRC and display the third result interface.
Quit :Exit the GDS Comparison Results window and its downwards.

3.1.3 View results :

❏ The third interface :

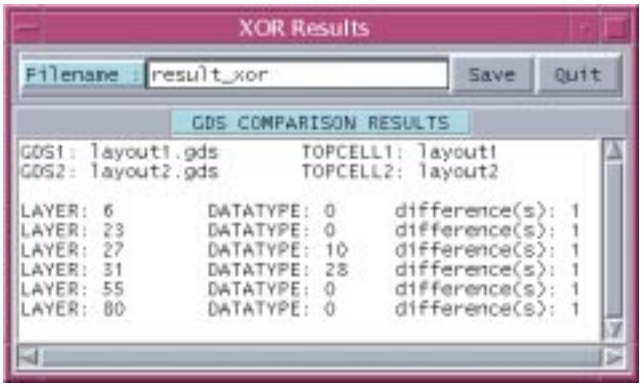


Figure 8: Final interface which shows XOR results after running calibre DRC.

This last interface displays results from Calibre comparison. To save results, enter the file name and press the save button. Then, a new file will appear in the current directory.
In the first interface, you can choose to display or not this interface.

❏ result_comp file :

Instead of displaying the third interface, GDSXOR.tcl tool supplies a file named **result_comp** containing informations from both GDS files comparison and from Calibre XOR comparison. An example of result_comp file is given below at Figure9.

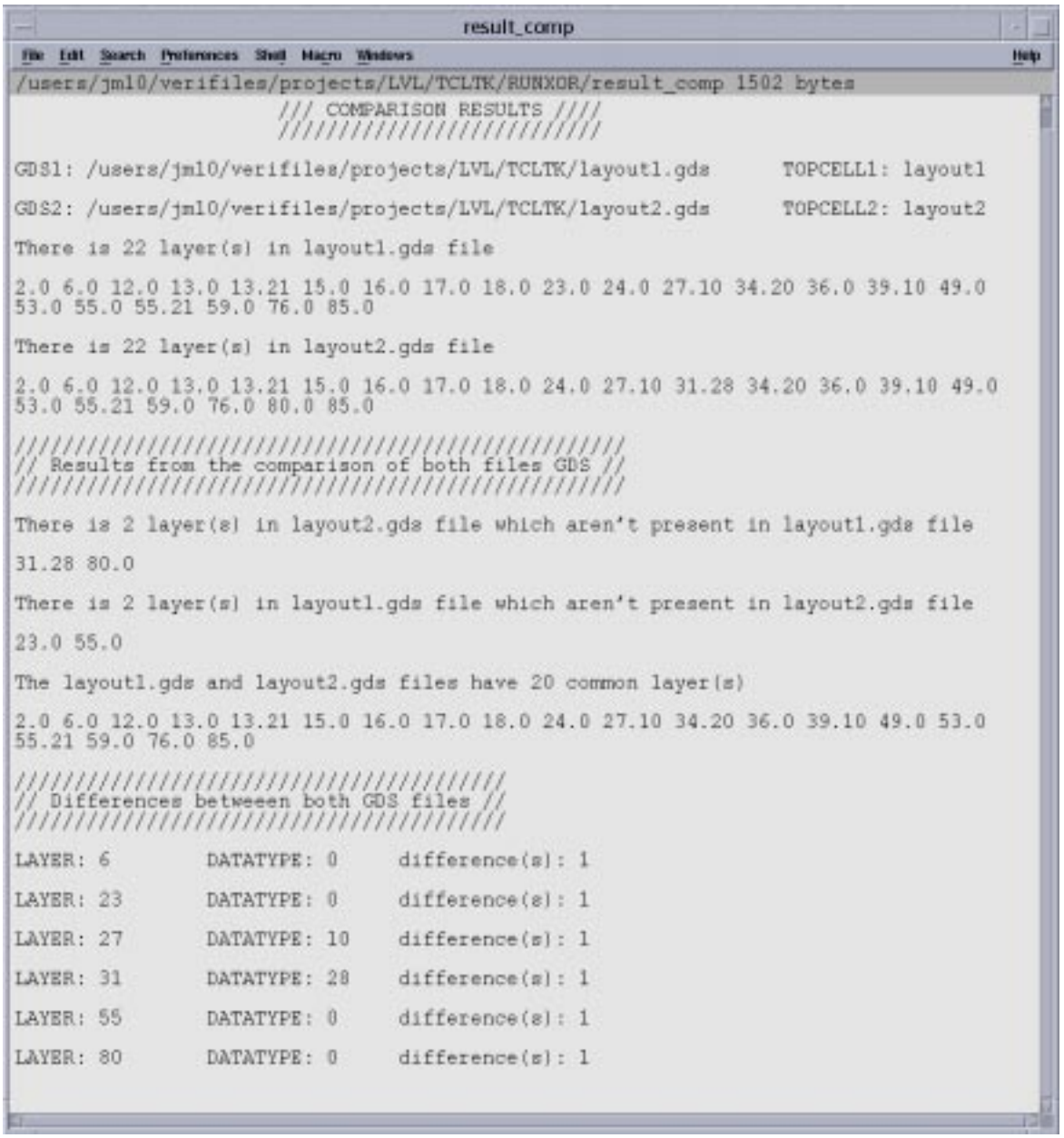


Figure 9: Example of result_comp file.

❑ Output file format : .db or .gds :

GDSXOR.tcl tool supplies in output either a .gds file viewing with tools like Streamview, GDS Display, and so on, or a .db file viewing with Calibre RVE. Figure10 and Figure11 show two examples of output files obtained after XOR comparison.

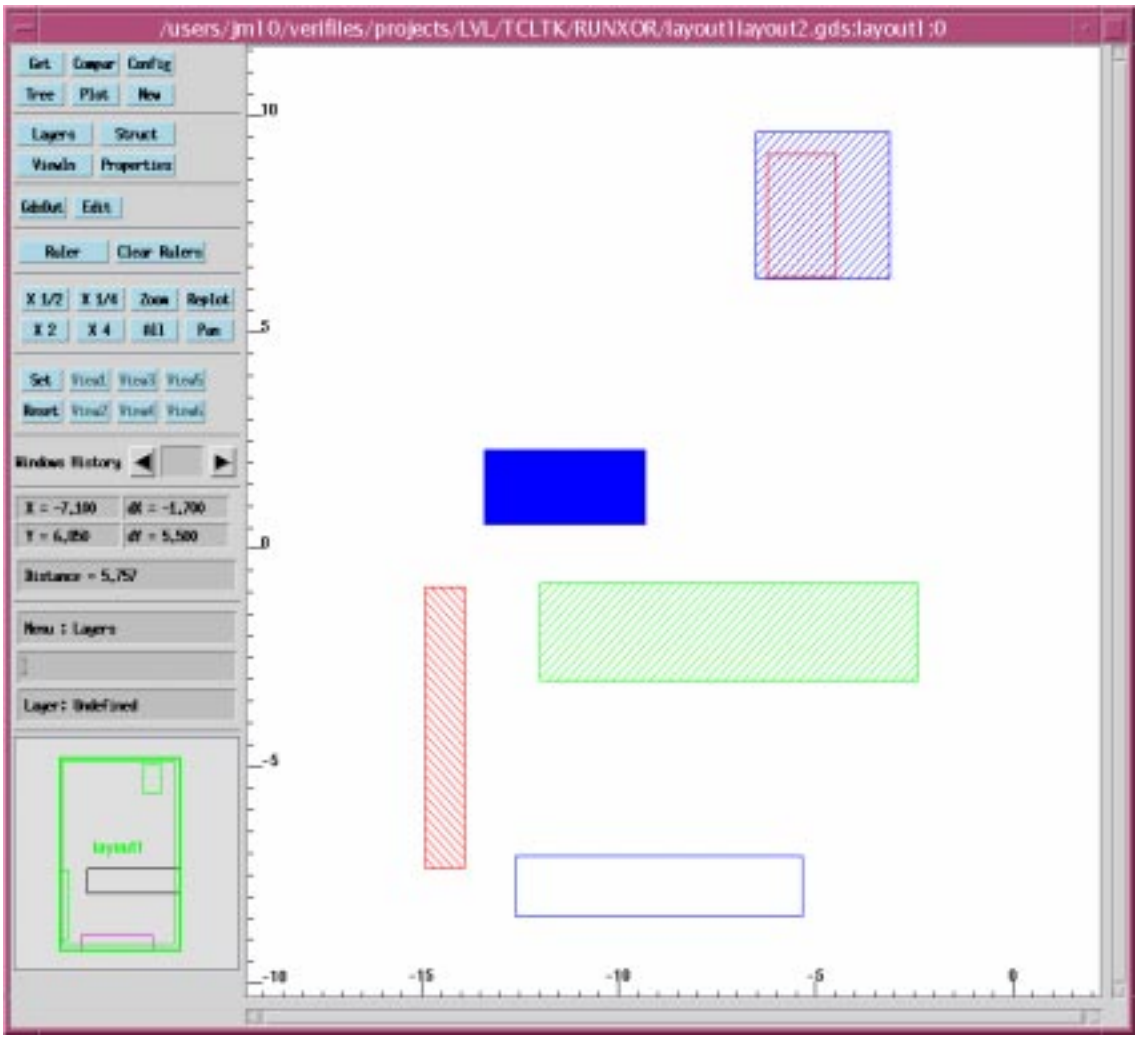


Figure 10: Example of .gds file obtainded after running Calibre DRC using GDD Display.

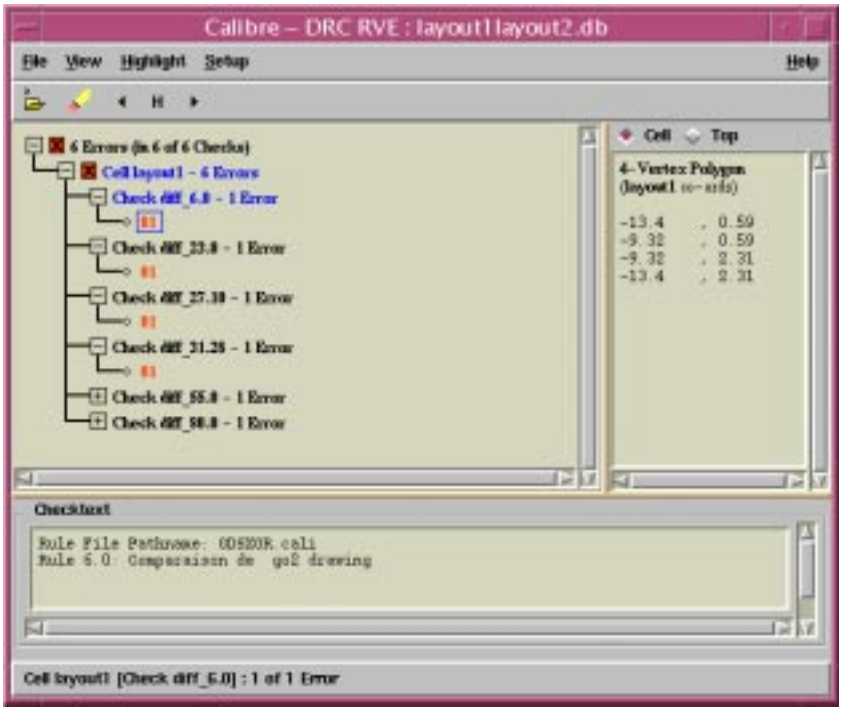


Figure 11: Example of .db file obtainded after running Calibre DRC using Calibre RVE.

3.2 GDSXOR by command line :

All informations about dkGDSXOR.tcl command line are given by the following syntax :

prompt> dkGDSXOR.tcl (and press ENTER).

Syntax :

dkGDSXOR.tcl -gds1 <file> **-cell1** <string> **-gds2** <file> **-cell2** <string> **[-format** <.db|.gds>**] -grid** <float> **[-merge** <yes|no>**] [-list** <yes|no>**] [-userlist** <yes|no>**] [-listfile** <file>**] [-lmt** <yes|no>**] [-lmtfile** <file>**] [-turbo** <yes|no>**] [-ncpu** <int>**] [-display_int2** <yes|no>**][-display_int3** <yes|no>**] [-help|-h|-u|-U] [-gui]**

where:

-gds1	GDS File 1:.
-cell1	Top Cell 1:.
-gds2	GDS File 2:.
-cell2	Top Cell 2:.
-format	Choice for the output format
-grid	Value of the Grid for the Te
-merge	Merge all datatypes of the sn. Default is ’no’.
-list	Use a List of Layers/datatypno’.
-userlist	User List of Layers/datatype
-listfile	Path of the user layers list
-lmt	Layer Map Table To Compare:.
-lmtfile	Path of the Layer Map Table
-turbo	Multi-threaded Parallel Procult is ’yes’.
-ncpu	Maximum Number of Cpu.
-display_int2	display second interface res
-display_int3	display third interface resu
-help|-h|-u|-U	Display the script usage.
-gui	Graphical user interface.

Extra conditions:

-userlist	Can be used only when ’$data
-listfile	Can be used only when ’([inferlist=="yes")’
-lmtfile	Can be used only when ’$lmt=
-ncpu	Can be used only when ’$turb

with the userlist given as below in any order:

liste file
25.0 23.32 1.0 6.10 ...