Using REPLACE for pattern post processing

This Application Note details the usage of REPLACE and FILTER to post process a design by tweaking the unit cells for pattern restructuring.
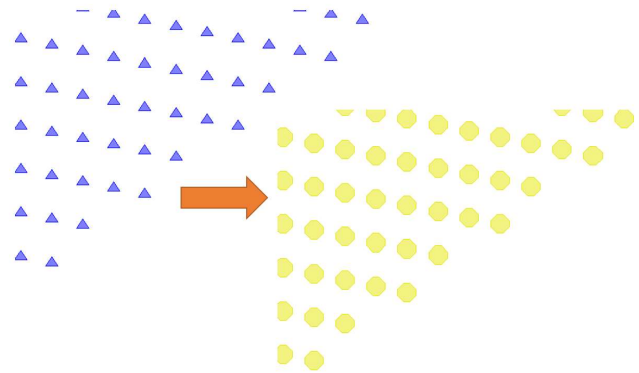
INTRODUCTION

It happens more often that an existing design needs to be modified by a new structure or that a mixed design needs to be modified in some parts but not in others. For this the FILTER and the REPLACE modules in BEAMER can be used.

FILTER allows to select specific elements by criteria such as size, area, shape and isolate them to a specific layer.

REPLACE can pick elements of a cell and replace these by other elements.

The combination of these two options gives great flexibility to post process a design after creation with little effort and greater ease.
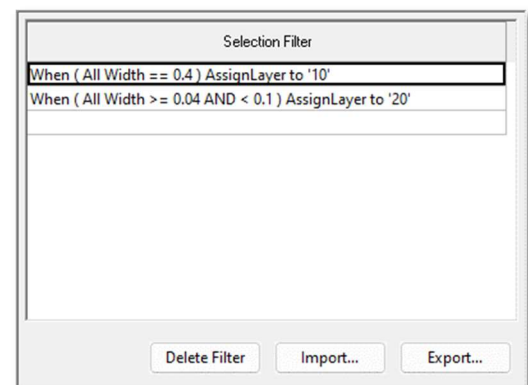
INCOMING PATTERNS

In general, the need to post process a pattern for shapes comes in when you have a situation where an old design is reused but a certain shape or size of an element has changed. When a regular pattern operation like BIAS doesn't solve the situation is maybe more feasible to replace an existing pattern element. These modified designs can be generated by more complex pattern operations or an integrated editor in BEAMER.

Optionally it may be required to load older processed machine file to next exposure or modified the previously exposed patterns again.

FILTER

Filter helps to sort out elements by characteristics of the elements and either filter them exclusively or as an alternative assign them to a specific layer so that the data can be then post processed by extracting that specific layer.

Filter width and assign

In this setup there are two filters active where one goes for an exact size of a layout element of 0.4um

The second filter goes for elements that are between 40nm and 100nm in size.

The results are assigned to layer 10 and layer 20 correspondingly.

Note here that as the filters are setup one after the other, they are processed from top to bottom. It is possible to filter elements twice as the filter line is always working on the full incoming pattern.

For the working of other options like circle shape, rings, area and so forth please refer to the manual of BEAMER in the FILTER module or press HELP in the FILTER dialog.
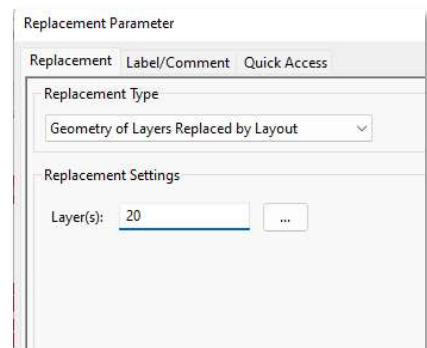
REPLACE

The REPLACE has two ports for accepting patterns. The left one is operational all by itself accepting the incoming pattern and performing a specific operation from replacing a certain layer element by a placeholder or compacting data if possible.

It can even potentially be used in this fashion to anonymize layouts by replacing every element with a rectangle.

When the second port is used it can basically replace the identified cell by the parameters with the layout that is coming in via the second port.

In our case here we replace the elements on layer 20 with the incoming patterns attached to the second port. Here you can also work with loops where you exchange the layout to be processed layer by layer and the patterns to be placed as coupled loop variables.

CONCLUSSION

We explored the principal options of FILTER and REPLACE to modify a given pattern to replace some existing shapes with new ones.

The applications can be from modifying old patterns for new purpose or to optimize patterns with shapes that are supported by the export format.