Mask for ASE standardization

The mask is called Danchip ASE Quality control MASK or `daqmask`.

Requirements

- The load of the mask is 10%, both macroscopcally and microscopically.
- The standard recipes of the ASE (`shallolr` and `deepetch`) are designed and optimzed for etching of 2 μm and 50 μm structures respectively. Hence, the standardization features should have the same dimensions.

Functionalities

- 9 point standardization for ASE `shallolr` and `deepetch` recipes.
- Etch rate determination in holes compared to that of trenches, i.e. with identical diameter/widths.
- Special test fields for selectivity measurements.
- Special test fields for fast determination of etch rates: Before cleaving the wafer is processed in the Dektak to verify that the etch rate is ok.
- Variation of feature sizes in two series: (2, 4, 6, 9, 14, 25, 50, 90, 150, 250, 400 μm) and (10, 15, 25, 50, 100, 300, 500 and 1000 μm).

Description of mask test fields

The colors correspond to the colors in figure 2.

ASE test field numbered 1-9 The 1×1 cm **ASE test** fields are form a cross on the mask as shown in the figures 1 and 2.

1. **2 μm lines:** Towards the center of the wafer is a 5000×10000 μm field with 2 μm lines for `shallolr`.
2. **50 μm lines:** The remaining 5000×10000 μm have 50 μm lines for `deepetch` standardization.
3. **Numbering:** Towards the wafer periferi the number of 2 μm lines indicates which ASE test field it is.

Holes The **Holes** test fields contain holes

1. **2 and 6 μm holes:** Towards the center of the wafer (only in the 'cross', off cross: To the left of the field) is a 5100×10000 μm field with a mixture of holes with a diameter of 2 μm and 6 μm with a ratio 4:1
2. **50 μm holes:** The remaining 4900×10000 μm have 50 μm diameter holes.

Dektak test field The **Dektak** test fields are designed for fast etch rate determination using the Dektak.

1. 25 μm lines: The upper left 5000×5000 μm quarter has a center field (1000×1000 μm) containing 4 25 μm lines with 'Dektak landing' sites on each side for automated runs. Dummy structures are 2 μm lines.
2. 50 μm lines: The upper right 5000×5000 μm quarter has a center field (1000×1000 μm) containing 2 50 μm lines with 'Dektak landing' sites on each side for automated runs. Dummy structures are 50 μm lines.
3. 500, 250 and 150 μm lines: The lower 10000×5000 μm half has a center field (6000×1000 μm) containing one 500, one 300 and one 150 μm line with 'Dektak landing' sites on all sides for automated runs. Dummy structures are 50 μm lines.

Photoresist test field The **PR test** fields have an unstructured central 6000×6000 μm field for Filmtek measurement of masking material selectivity. The 2000 μm border has a high density of 25×25 μm squares to adjust the load to 100 %.

Test field with 10-1000μm lines The central part of the **2-400 μm** test field (20000×10000 μm) contains a series of trenches with different widths: 10, 15, 25, 50, 100, 300, 500 and 1000 μm. Dummy structures are 25×40 μm squares.

Test field with 2-400μm lines The central part of the **10-1000 μm** test field (20000×10000 μm) contains a series of trenches with different widths: 2, 4, 6, 9, 14, 25, 50, 90, 150, 250, 400 μm. Dummy structures are 25×40 μm squares.

Deskew point A for Dektak Deskew point **DP A** for Dektak analysis.

Deskew point B for Dektak Deskew point **DP B** for Dektak analysis.

Dummy structures Dummy structures denoted **10 %** in figure 1 are 25×40 μm squares.

Cleavage lines A, B1 and B2 The cleavage lines A, B1 and B2 indicate where to cleave the wafer for SEM analysis.

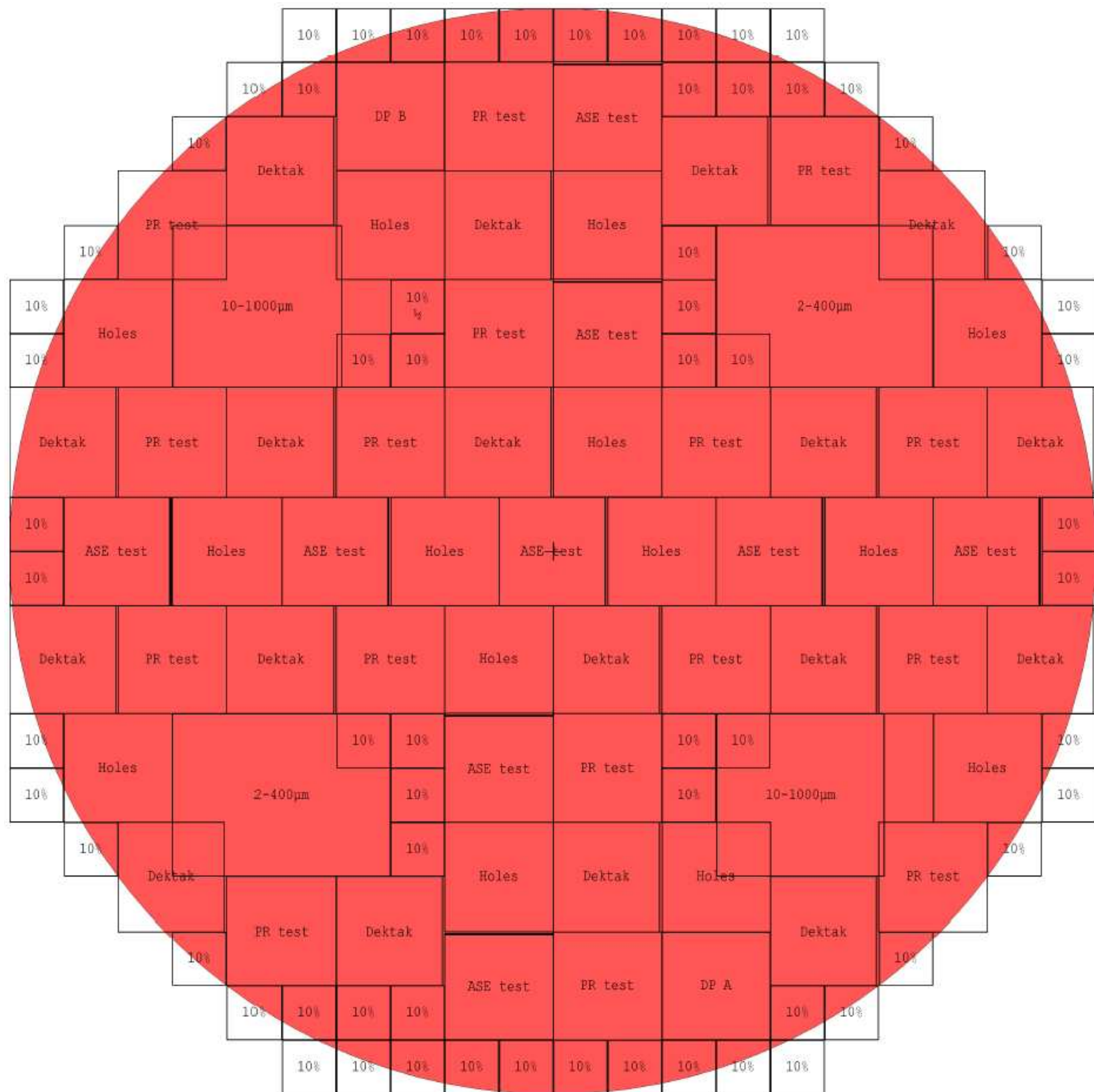

Figure 1: Layout of Daqmask with text. The size of the wafer is given by the red circle. The flat must point downwards.

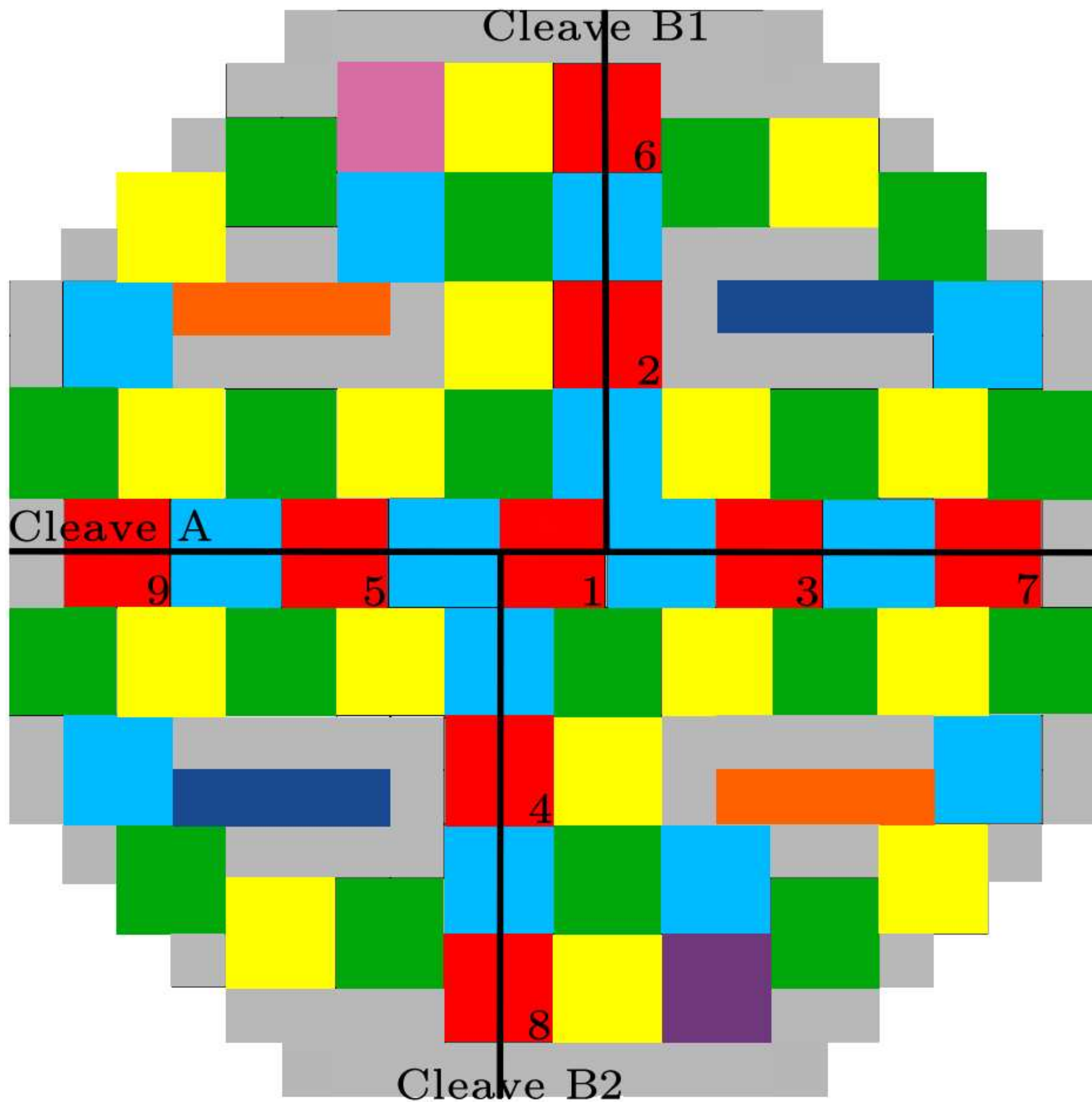

Figure 2: Layout of Daqmask with color.. The flat must point downwards.

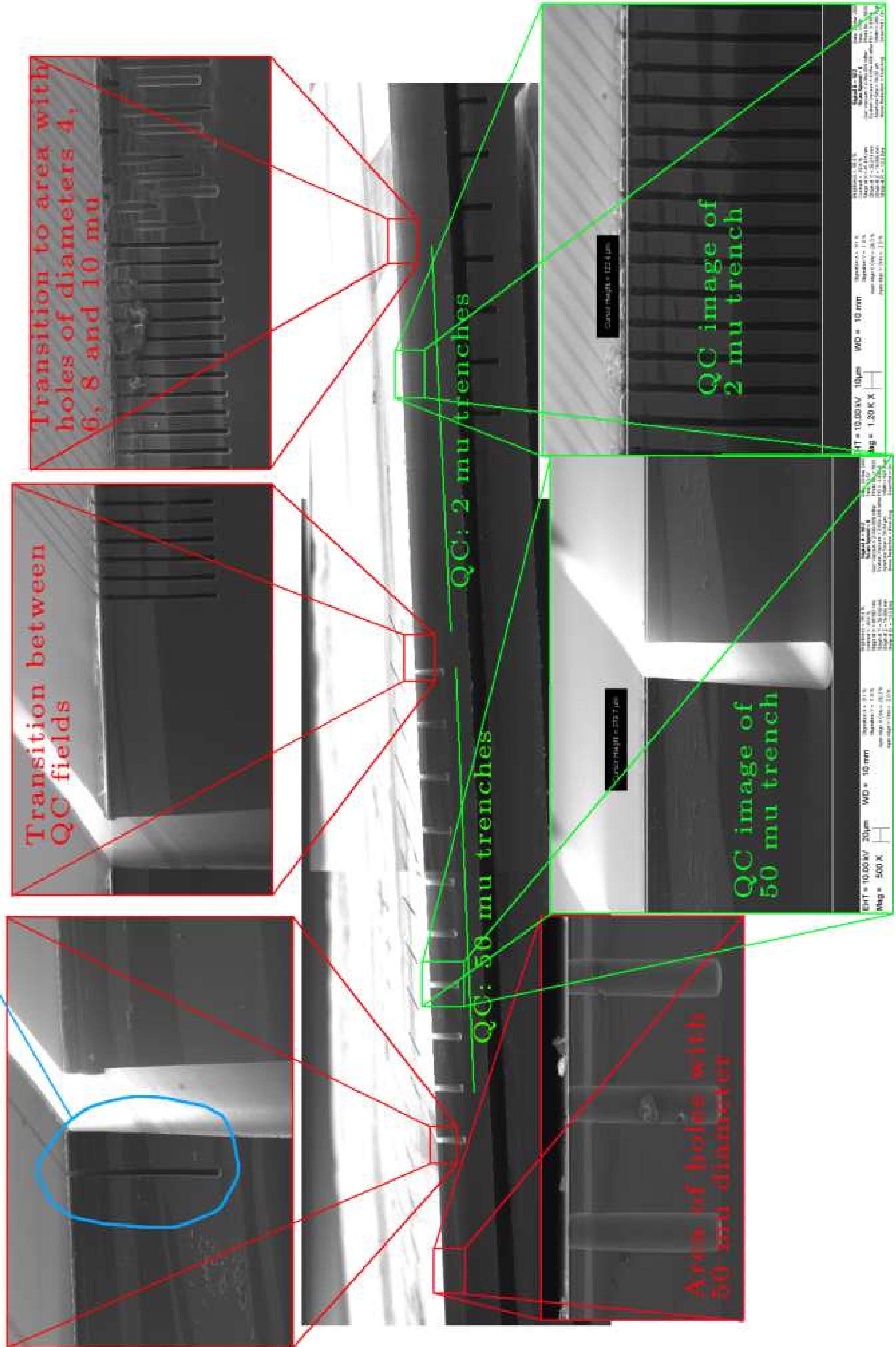

Figure 3: SEM image of profile of position 1.