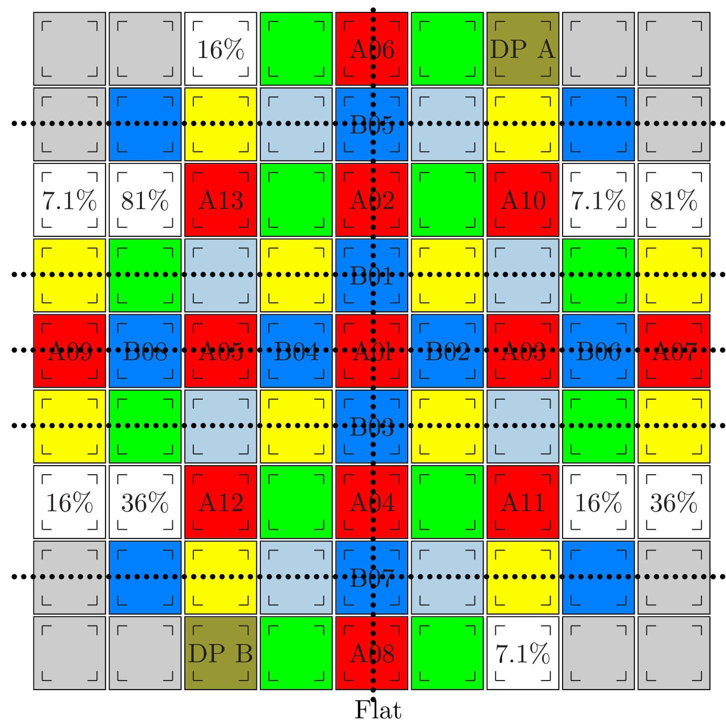
1 The mask layout



The mask is divided into 1×1 cm cells each of which has an opening density of 50 %. The Cells A01-A09 are to be used for standardization of OH_polya in the RIE's. The dotted lines ··· indicate possible cleavage lines for profile inspection in a SEM.

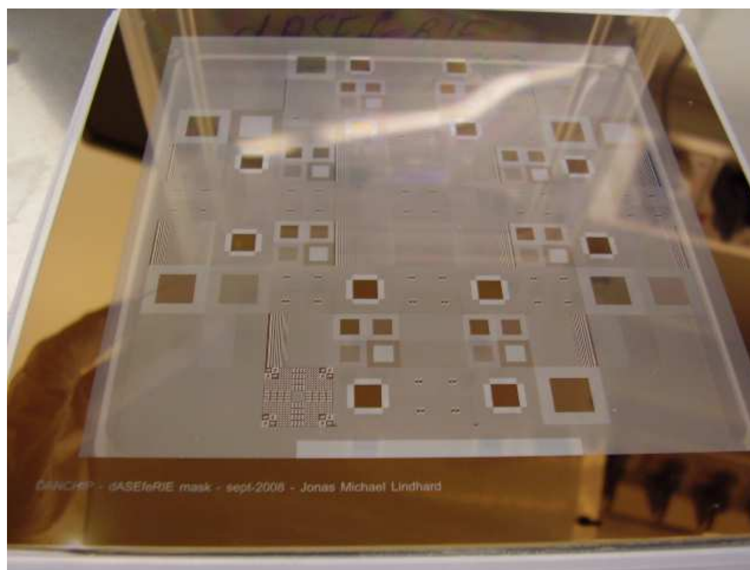


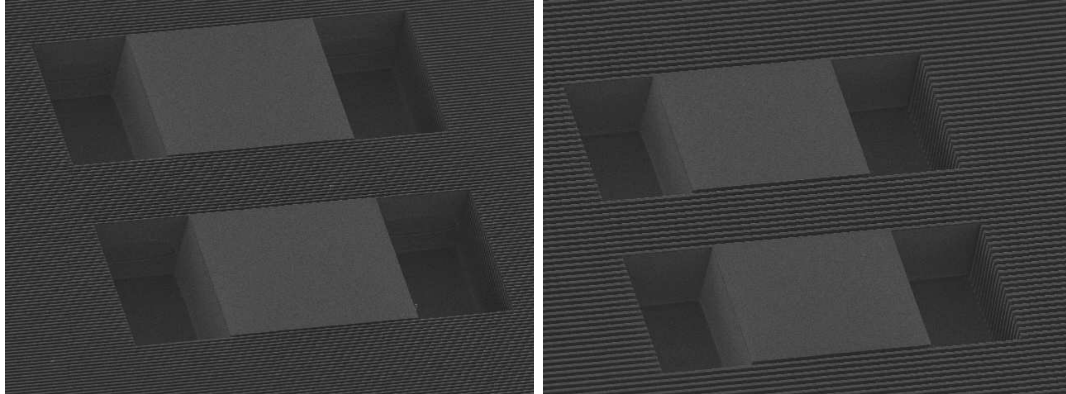
Figure 1: The dASEfeRIE mask

The text on the mask reads:
`DANCHIP - dASEfeRIE mask - sept-2008 - Jonas Michael Lindhard`

Date: April 15, 2009	Responsible: JML	Approved by:	Version: 1

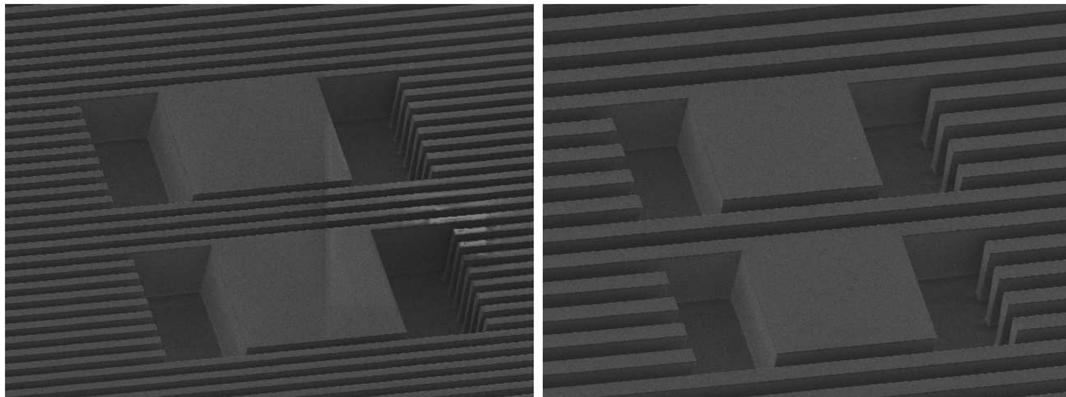
2 RIE Dektak fields

RIE: Dektak fields. Numbered A01 to A13



(a) The field with 5 μm lines in the upper left corner of the Dektak field.

(b) The field with 10 μm lines in the upper right corner of the Dektak field.



(c) The field with 25 μm lines in the lower left corner of the Dektak field.

(d) The field with 50 μm lines in the lower right corner of the Dektak field.

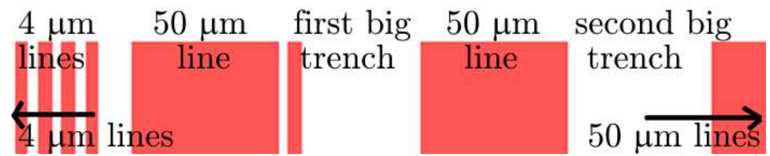
Figure 2: The Dektak is split into 4 areas with different linewidths. In the SEM images above they are etched with the deepetch recipe on the ASE - as such they are far too deep to be measured in the Dektak.

Split into 4 5000×5000 μm squares with 5, 10, 25 and 50 μm lines respectively. In the center of each square is a special 1000×1000 μm field for Dektak analysis. The numbers are located in the lower left corner and are to be read from above.

3 ASE fields for cleaving

ASE: Fields for cleaving. Number indication

Split into 2 5000×10000 μm squares with 4 and 50 μm lines respectively. The fields are rotated so that the 4 μm lines face towards the center of the wafer. The number of the field is indicated between the 4 and 50 μm lines, see figure.



(a) The position of the ASE fields is indicated in the center of the fields between the two areas. The number of 4 μm lines in the first 50 μm trench counts 1, the number in the second trench counts 2.

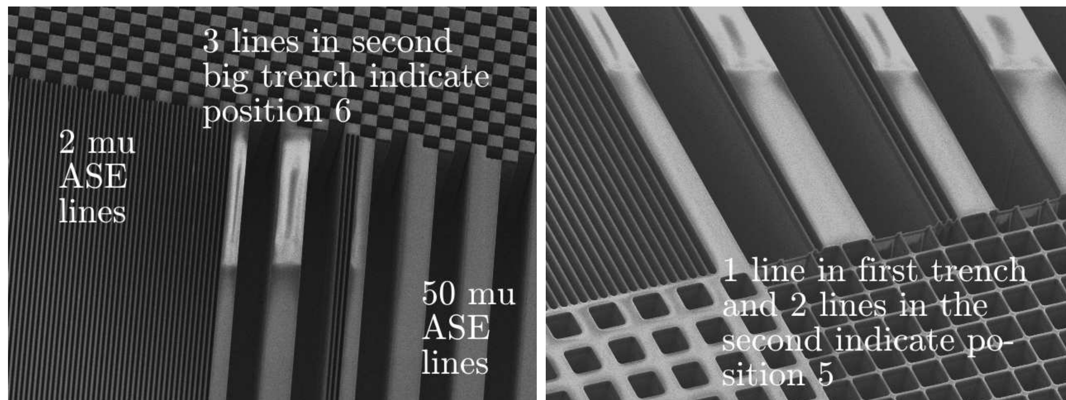
(b) Position 2: One 4 μm line in the second 50 μm trench indicates position 2.

(c) Position 5: One 4 μm line in the first 50 μm trench and two in the second indicates position 5 (1+2·2).

(d) Position 7: One 4 μm line in the first 50 μm trench and three in the second indicates position 7 (1+3·2).

(e) Position 8: Four lines in the second 50 μm trench indicates position 8 (4·2).

Figure 3: The numbering of the positions of the ASE fields makes it possible to tell the position when viewing the cleaved profile in a SEM.



(a) The ASE field in position 6 next to dummy squares.

(b) The ASE field in position 5 next to depletion range fields.

Figure 4: Top view SEM images of the ASE fields showing the center between the 2 μm and 50 μm lines where the position on the wafer is indicated. For proper SEM inspection the wafer should be cleaved perpendicular to these lines.

4 ASE fields for cleaving

ASE: Fields for cleaving. No numbering

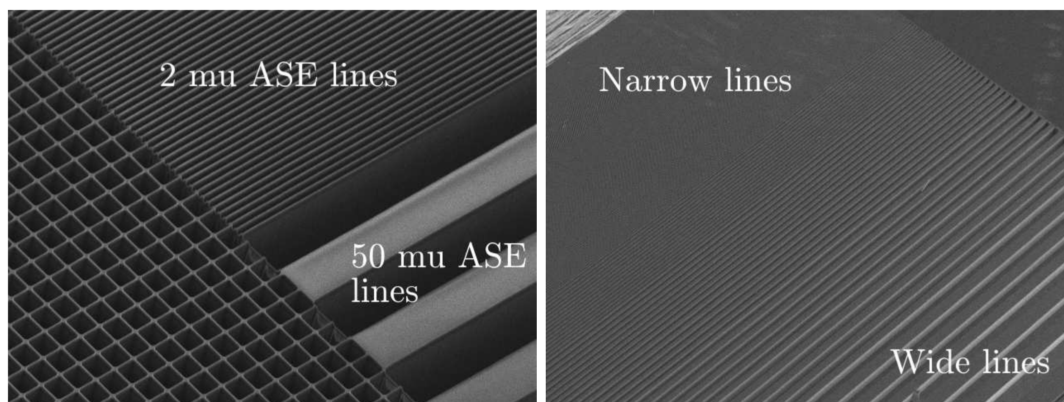
Split into 2 5000×10000 μm squares with 4 and 50 μm lines respectively.

5 ARDE fields

ARDE: Fields with different linewidths for cleaving. No numbering

The field contains lines with different widths as tabulated below. (With a global etch load of 50 % the pitch of the lines must be the same as the width.)

Line width (μm)	Number of lines	Width of field (μm)	End of field (μm)	Line width (μm)	Number of lines	Width of field (μm)	End of field (μm)
2	155	620	0	40	8	640	4910
3	100	600	620	50	6	600	5550
4	75	600	1220	75	5	750	6150
6	50	600	1820	100	4	800	6900
8	40	640	2420	150	3	900	7700
10	25	500	3060	200	2	800	8600
15	20	600	3560	300	1	600	9400
25	15	750	4160				



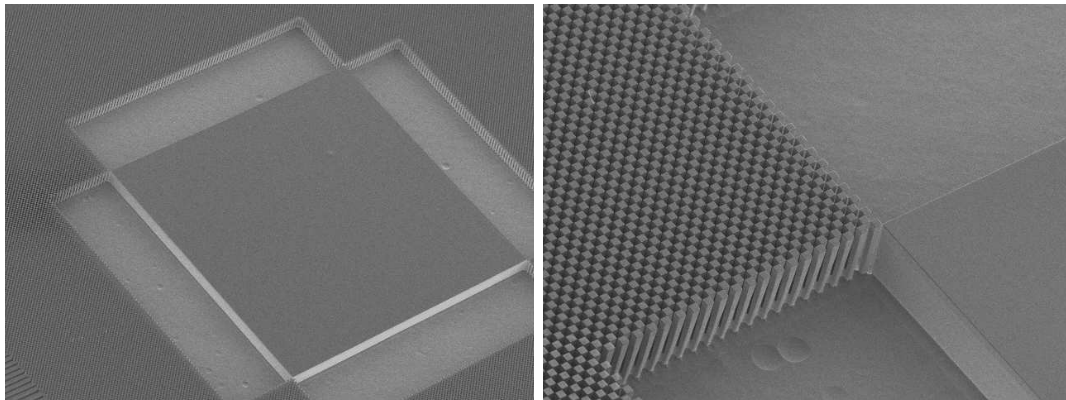
(a) The ASE field without position indicators. (b) The ARDE field

Figure 5: SEM images of the ASE and ARDE fields.

6 Filmtek fields

PRetch: Photeresist etch field. No numbering

The center 4×4 mm field has no structure allowing the photoresist etch rate to be determined using the Filmtek prior and after etching.



(a) The center field where the mask etch rate may be measured using the Filmtek.

(b) A close-up of the corner of the center Filmtek field.

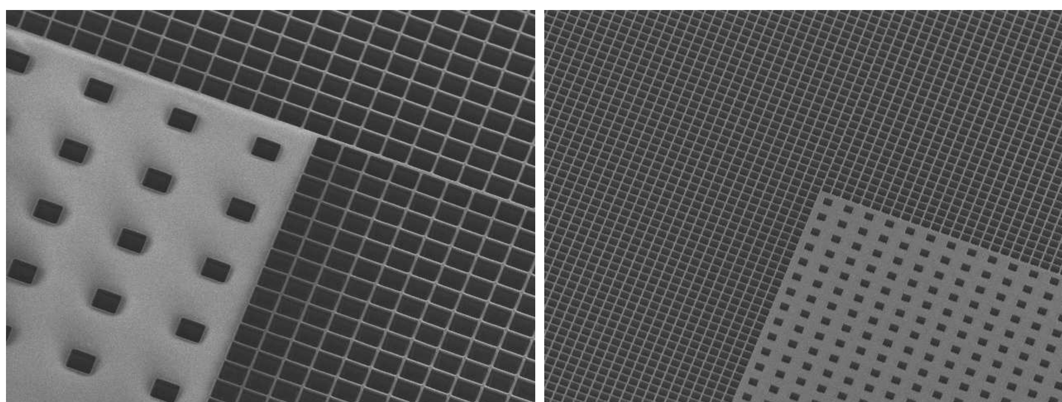
Figure 6: SEM images of the Filmtek fields.

7 Depletion range fields

Depletion: Variation of etch load in the center. No numbering

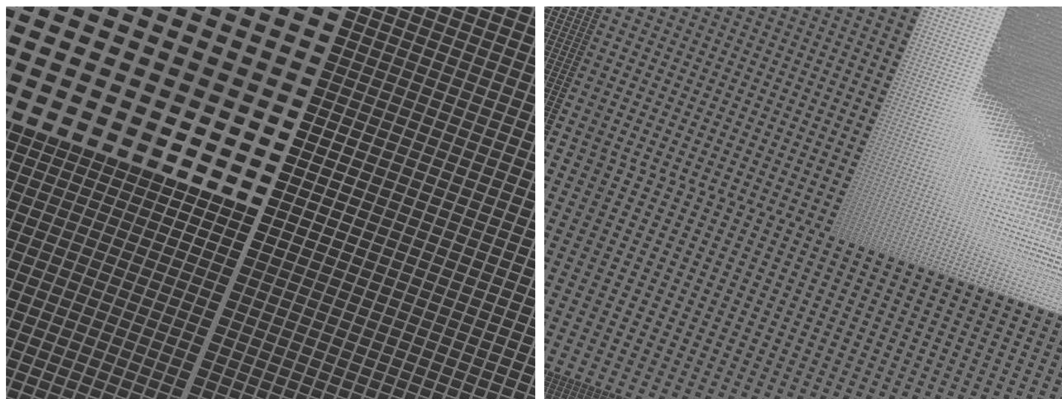
Split into 4 5000×5000 μm squares. These squares have a 3000×3000 μm center field and a 1000 μm wide outside perimeter. The density of 20 μm squares in the center field is varied according to the table below. The density of the outside perimeter is adjusted to give a total load of 50 %.

Center 3000×3000 μm field				Outside perimeter			
20 μm Array	Pitch		Load	20μm array 1000×4000 μm	Pitch		Load
	X	Y	%		X	Y	%
40×40	75	75	7.1	43×173	23.3	23.1	74.4
60×60	50	50	16	42×166	23.8	24.1	69.7
90×90	33.3	33.3	36	38×153	26.3	26.1	58.1
135×135	22.2	22.2	81	29×113	34.5	35.4	32.8



(a) The center field (left) with 7.1 % density and outside perimeter with 74.4 % density.

(b) The center field (right) with 16 % density and outside perimeter with 69.1 % density.



(c) The center field (upper left) with 36 % density and outside perimeter with 58.1 % density.

(d) The center field (upper right, partially underetched) with 81 % density and outside perimeter with 32.8 % density.

Figure 7: The 4 fields of the depletion range field.

8 Big depletion fields

Big depletion: Variation of etch load in the center. No numbering

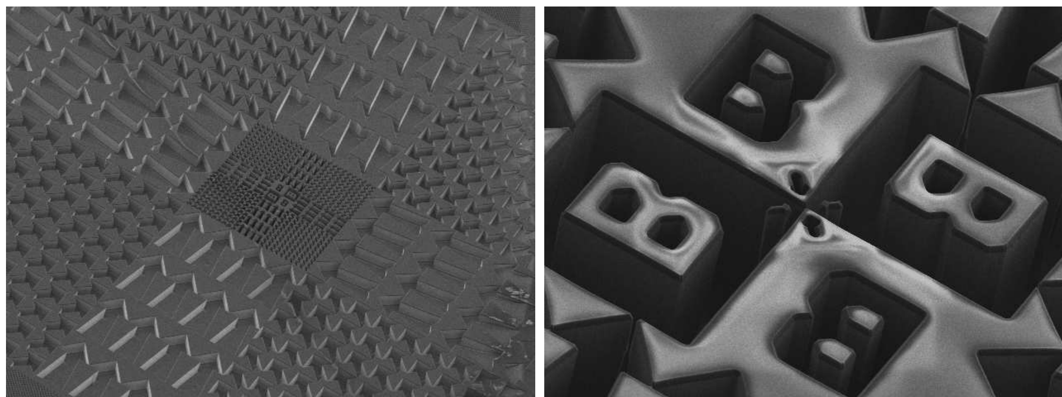
The 4 different etch loads collected in the depletion field (the 4 5000×5000 µm square fields above) are enlarged to make an entire field. There is a 6000×6000 µm center field and a 2000 µm wide outside perimeter. The density of 20 µm squares in the center field is varied (the values are shown on the figure) according to the table below. The density of the outside perimeter is adjusted to give a total load of 50 %.

Center 6000×6000 µm field				Outside perimeter			
20 µm Array	Pitch X	Pitch Y	Load %	20µm array 1000×4000 µm	Pitch X	Pitch Y	Load %
80×80	75	75	7.1	86×345	23.3	23.2	74.2
120×120	50	50	16	83×333	24.1	24.0	69.1
180×180	33.3	33.3	36	76×306	26.3	26.1	58.1
270×2700	22.2	22.2	81	58×226	34.5	35.4	32.8

9 Deskew points

Deskew points A and B

Deskew points A and B for Dektak automated runs.



(a) Overview of the Deskew point B with arrows pointing towards the center.

(b) A close-up of the Deskew point in the center.

Figure 8: SEM images of Deskew point B.

10 Dummy structures

Dummy structures

Dummy structures: Checkboard of 25×25 µm squares, 50 % load.

Date: April 15, 2009	Responsible: JML	Approved by:	Version: 1