CORNERSTONE DUV lithography Submission Form Guidance

This document is a walkthrough of the DUV job submission form, aiming to explain the necessary information we need to understand your requirement for the submitted DUV lithography job.

DUV Job submission Location:

https://www.cornerstone.sotonfab.co.uk/duv-job-submission-form

Part 1 – User Details

The first part of the form asks you to fill in your basic information like who you are and how do we contact you.

Name *

Email address *

Company *

Telephone number *

Shipping address *

Part 2a – Design Details (Wafer Information)

In the second part of the form, you will be asked to fill in information about the information of the wafers that will be processed.

How many wafers do you require? *

What is your substrate? *

Please list all materials and approximate thicknesses in your layer stack on the substrate *

Will you provide the wafers? *

- I will provide the wafers
- I need you to supply the wafers

Please confirm that the wafers have not been processed in any tools that also process copper or gold *

Please select the required resist thickness *

- 680 nm
- 1 um
- 1.3 um

a). How many wafers do you require?

Please specify how many production wafers you would like to have in this run.

b). What is your substrate?

Please tell us what your substrate is (i.e. Si, 220nm Si /2um BOX SOI, etc.). Please be advised that we are only able to process Si substrates with an approximate thickness of 700 µm.

c). Please list all materials and approximate thicknesses in your layer stack on the substrate

Please tell us the layer stack on top of the substrate. Please describe the layer stack from the top surface to the substrate. For example, the layer stack in ***Figure 1*** will be described as 300 nm SiO_2 on 220 nm Si / 2 µm box SOI substrate. **Please find the current allowed materials in Appendix 1.**

Figure 1 Sample layer stack of 300 nm SiO_2 on 220nm Si on 2µm BOX on Si substrate

d). Will you provide the wafers?

Please let us know if you will be providing the wafers or you wish us to supply the wafers.

e). Please confirm that the wafers have not been processed in any tools that also process copper or gold

If you are supplying wafers to us, please confirm that the wafers have not been processed in any tools that also process gold or copper. This is to prevent cross-contamination into our lithography line of these materials.

f). Please select the required resist thickness

Currently we offer 3 different selections of the total resist thickness, which are 680 nm, 1 µm, and 1.3 µm. The thickness mentioned has included a 40 nm thick BARC (Bottom Anti-Reflection Coating) underneath the resist.

Part 2b – Design Details (Mask & Shot Information)

What is the title of the reticle to expose? *	
What specification of reticle do you require? *	○ Standard without pellicle ○ High without pellicle ○ Ultra-High without pellicle ○ Standard with pellicle ○ High with pellicle ○ Ultra-high with pellicle ○ The reticle has already been ordered
Which parts of the reticle should be exposed? *	
What is the shot x-pitch on the wafer (mm)? *	
What is the shot y-pitch on the wafer (mm)? *	

a). What is the title of the reticle to be exposed?

Please let us know the title(s) of the reticle(s) that will be used in this run.

b). What specification of reticle do you require?

If a new reticle needs to be ordered for this job, please let us know the required specification based on ***Table 1*** below. If we already have the reticle in stock as it is a repeat job, please select the "The reticle has already been ordered" option.

Table 1 Available reticle specifications

Mask Grade	Pellicle*	Address Size Reticle (µm)	Min. Feature Size Reticle (µm)	Min. Feature Size Wafer (µm)†	CD Tolerance Reticle (µm)	Defect Density (µm)
Standard	No	0.0625	2	0.5	0.15	0>1.0
High	No	0.005	0.8	0.2	0.08	0>0.5
Ultra-High	No	0.005	0.5	0.125	0.03	0>0.25

Standard	Yes	0.0625	2	0.5	0.15	0>1.0
High	Yes	0.005	0.8	0.2	0.08	0>0.5
Ultra-High	Yes	0.005	0.5	0.125	0.03	0>0.25

*A pellicle is a protective film which is placed out of the focal plane on the reticle to protect it from dust and other particles. This is typically only used for production reticles which are frequently used.

†The feature size is shrunk by 4x on the wafer relative to the reticle. You should submit your gds file with dimensions as on the wafer. The mask shop will perform the 4x expansion of feature size.

c). Which parts of the reticle should be exposed?

Please describe which part(s) of the reticle should be exposed. The reticle can be used as a full or divided into different parts. For example, you can divide one reticle into 4 quadrants. To avoid confusion, we use mathematical quadrants, as shown in ***Figure 2***.

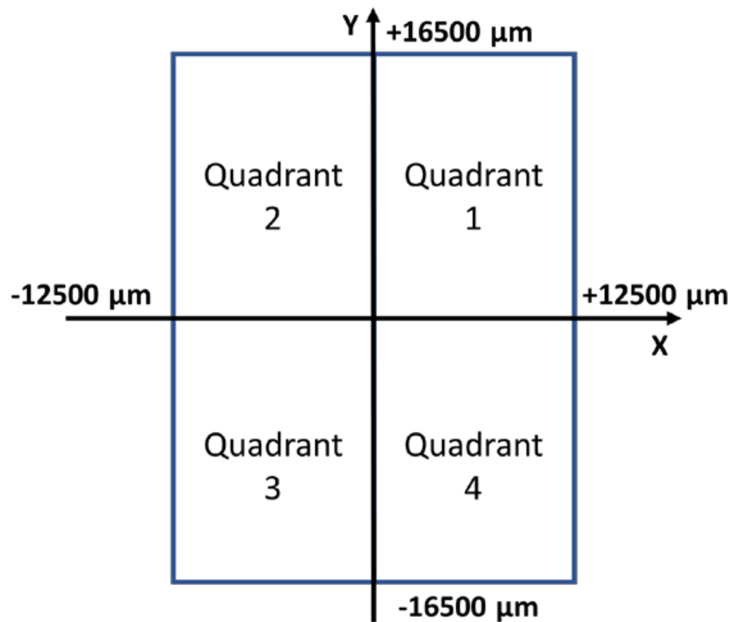

Figure 2 Example of 4-quadrant splitting reticle design

Alternative responses could be “full reticle”, meaning the full reticle area 25000 µm x 33000 µm; or “top half”, meaning expose X from -12500 µm to +12500 µm and Y from 0 to +16500 µm. If a specific opening area is desired, please put down the coordinates, for example: X: -10000 µm to +10000 µm, Y -15000 µm to +15000 µm.

d). What is the x-pitch on the wafer between shots (mm)?

Please specify the pitch in X direction. This is usually the total width of the shot (including border added by CORNERSTONE team containing alignment marks etc). It is also possible to add blank space between shots if desired.

e). What is the y-pitch on the wafer between shots (mm)?

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Please specify the pitch in Y direction. This is usually the total height of the shot (including border added by CORNERSTONE team containing alignment marks etc). It is also possible to add blank space between shots if desired.

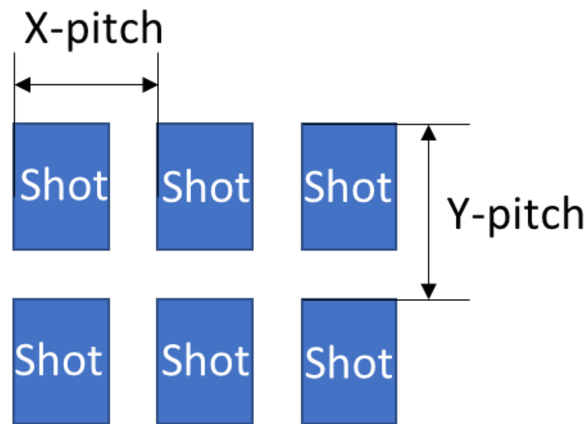

Figure 3 Shot pitch in X & Y

Part 2c – Design Details (Lithography Information)

If the exposure dose you require is known, please enter it here	
Please specify the critical dimension *	
What is the nature of the critical dimension? *	○ Trench ○ Resist feature
Please supply the coordinates of the critical dimension in the GDS file *	
What do you require at the centre of the wafer? *	○ Centre of shot (odd-odd shot map) ○ Middle line of X and gap between Y (odd-even shot map) ○ Middle line of Y and gap between X (even-odd shot map) ○ Gap between both X&Y (even-even shot map) ○ Other (give details in comments)
Do you require alignment or is this a first print job? *	○ Alignment required ○ First print job

a). If the exposure dose you require is known, please enter it here

If you know the exposure dose that you would like to appoint, please provide it here.

b). Please specify the critical dimension

Please let us know the critical dimension of your design. This is the dimension that is most important to optimise. Unless a specific exposure dose has been requested, we will set the exposure dose to optimise this dimension. Note that all other dimensions may have a small bias.

c). What is the nature of the critical dimension?

Please specify the nature of the critical dimension. It could be a resist feature (resist rib) or a trench. Examples are shown in ***Figure 4***.

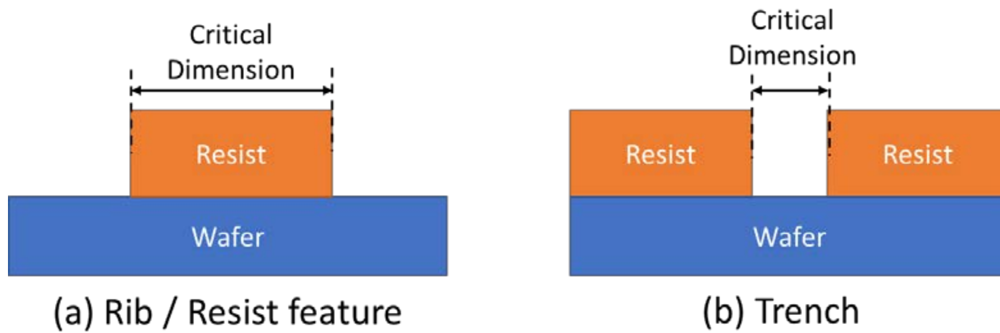

Figure 4 Critical dimension of (a) Resist feature and (b) Trench

d). Please supply the coordinates of the critical dimension in the GDS file

Please provide the coordinates of the critical dimension feature in the GDS file. Please make sure the origin of the coordinate system is the centre of the GDS.

f). What do you require at the centre of the wafer?

Please let us know what you want to be at the centre of the wafer. It could be one of the following (as shown in ***Figure 5***):

- **Odd-Odd**, which means both row and column have odd number of shots, and the centre of the wafer is the centre of the shot
- **Odd-Even**, which means odd number of shots in row and even number of shots in column, and the middle line of X and the gap between Y would be presented at the centre of the wafer
- **Even-Odd**, Odd-Even, which means even number of shots in row and odd number of shots in column, and the middle line of Y and the gap between X would be presented at the centre of the wafer
- **Even-Even**, which means both row and column have even number of shots, and at the centre of the wafer is the gap between both X & Y
- **Other**, please specify this in the comments. We have other customers which described the special shot map using one out of four shot maps mentioned above with a wafer scale offset (i.e. Odd-Odd map with global offset of X:+10mm, Y: -10mm).

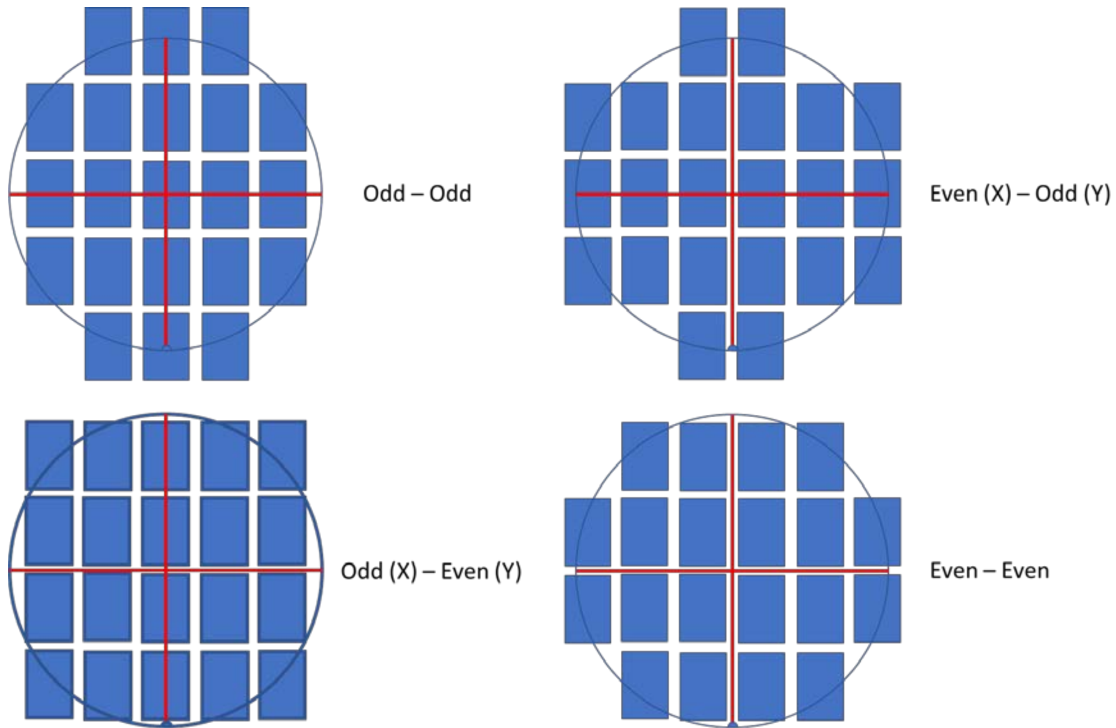

Figure 5 Different arrangements of shotmap

f). Do you require alignment or is this a first print job?

Please let us know if this job would be the first layer (a.k.a 1st print) on the wafer or it is a subsequent layer (a.k.a 2nd print). If it is a subsequent layer, please continue to complete the following questions.

Part 3 – Alignment Information

Alignment Information

Only complete this section if alignment to layers already patterned on the wafer/s is required

Please enter the coordinates of the alignment marks on the wafer	
Is the centre of the design at the centre of the shot?	○ Yes ○ No (please add details in the comments below)
Is there any rotation relative to the wafer notch?	○ Yes (please add details in the comments below) ○ No
What is at the centre of the wafer on the layers you want to align to?	○ Centre of shot (odd-odd shot map) ○ Middle line of X and gap between Y (odd-even shot map) ○ Middle line of Y and gap between X (even-odd shot map) ○ Gap between both X&Y (even-even shot map) ○ Other (give details in comments)

a). Please enter the coordinates of the alignment marks on the shot

Please let us know the coordinates of the alignment marks on the shot. Please refer to ***Figure 6*** for the example of how to get the coordinate of the alignment mark in the shot coordinate system.

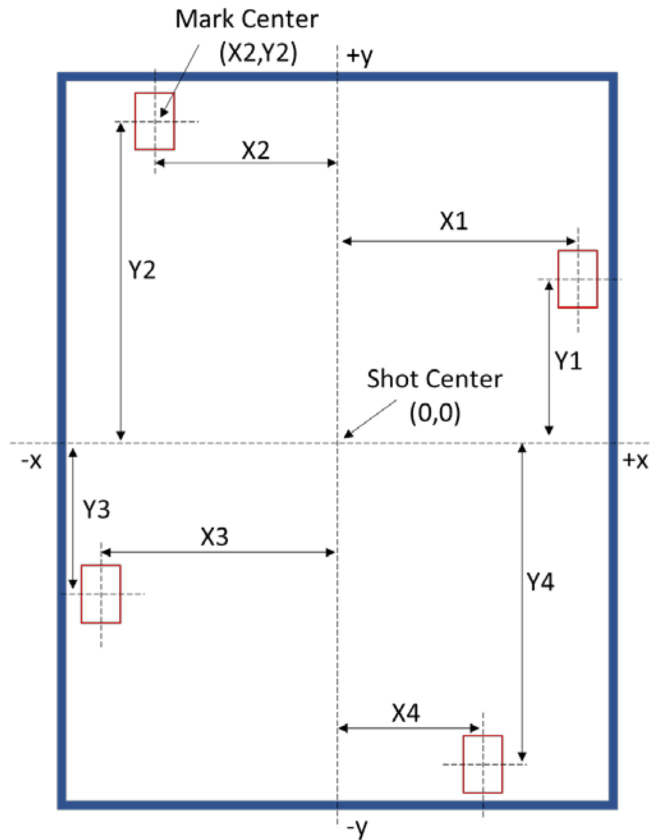

Figure 6 Alignment mark coordinates in the shot

c). Is the centre of the design at the centre of the shot?

Please specify if the centre of the design is at the centre of the shot, or is there any displacement between the centre of the design and the centre of the shot? Please refer to ***Figure 7*** for the example of a displacement between the centre of the design and the centre of the shot.

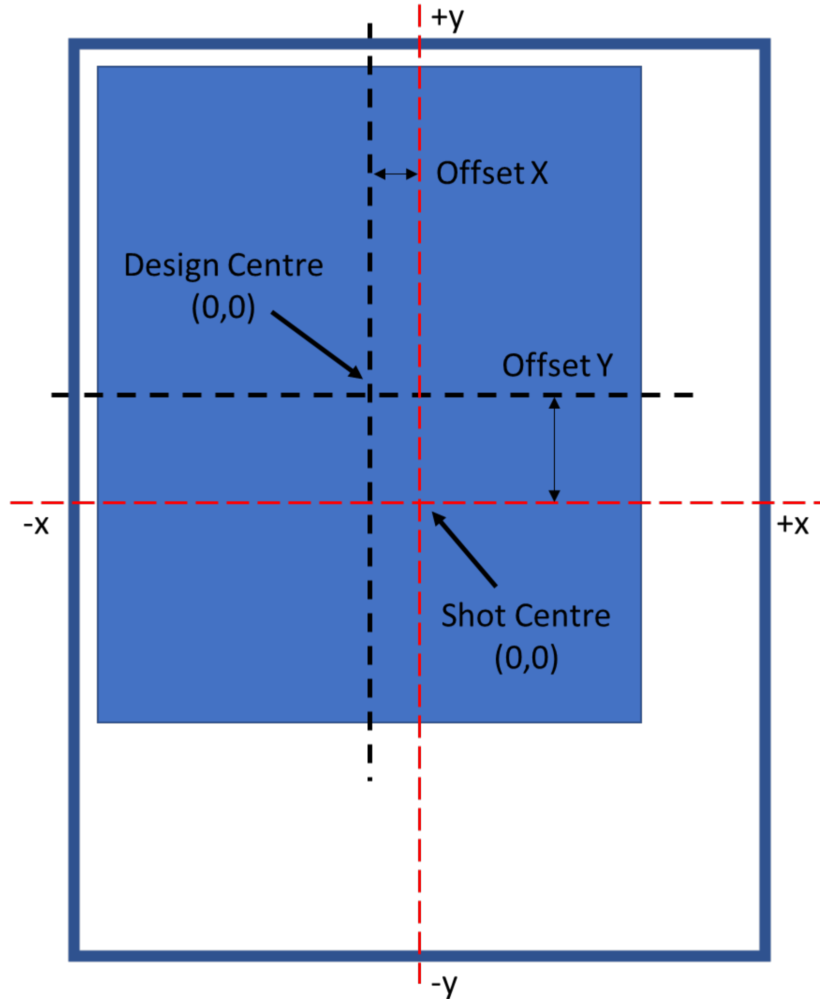

Figure 7 Example of a displacement between centre of the design and centre of the shot

d). Is there any rotation relative to the wafer notch?

Occasionally, we find that the customer supplied wafer with previous layer on has a rotation on the design relative to the wafer notch. Please let us know if there is any rotation in the wafer supplied to us.

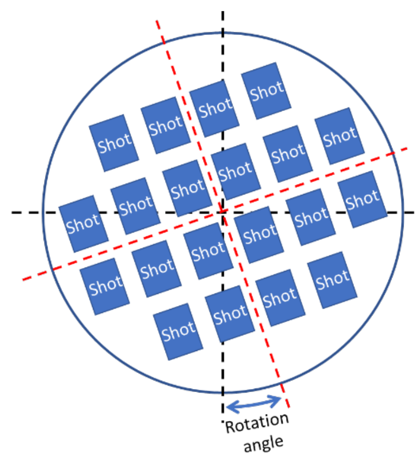

Figure 8 Design rotated with respect of the wafer notch

f). What is at the centre of the wafer?

Please specify what is at the centre of the wafer of the previous layer. Similar to the question in Part 2c, the shot map could be one of the following:

- **Odd-Odd**, which means both row and column have odd number of shots, and the centre of the wafer is the centre of the shot
- **Odd-Even**, which means odd number of shots in row and even number of shots in column, and the middle line of X and the gap between Y would be presented at the centre of the wafer
- **Even-Odd**, Odd-Even, which means even number of shots in row and odd number of shots in column, and the middle line of Y and the gap between X would be presented at the centre of the wafer
- **Even-Even**, which means both row and column have even number of shots, and at the centre of the wafer is the gap between both X & Y
- **Other**, please specify this in the comments. We have other customers which described the special shot map using one out of four shot maps mentioned above with a wafer scale offset (i.e. Odd-Odd map with global offset of X:+10mm, Y: -10mm).

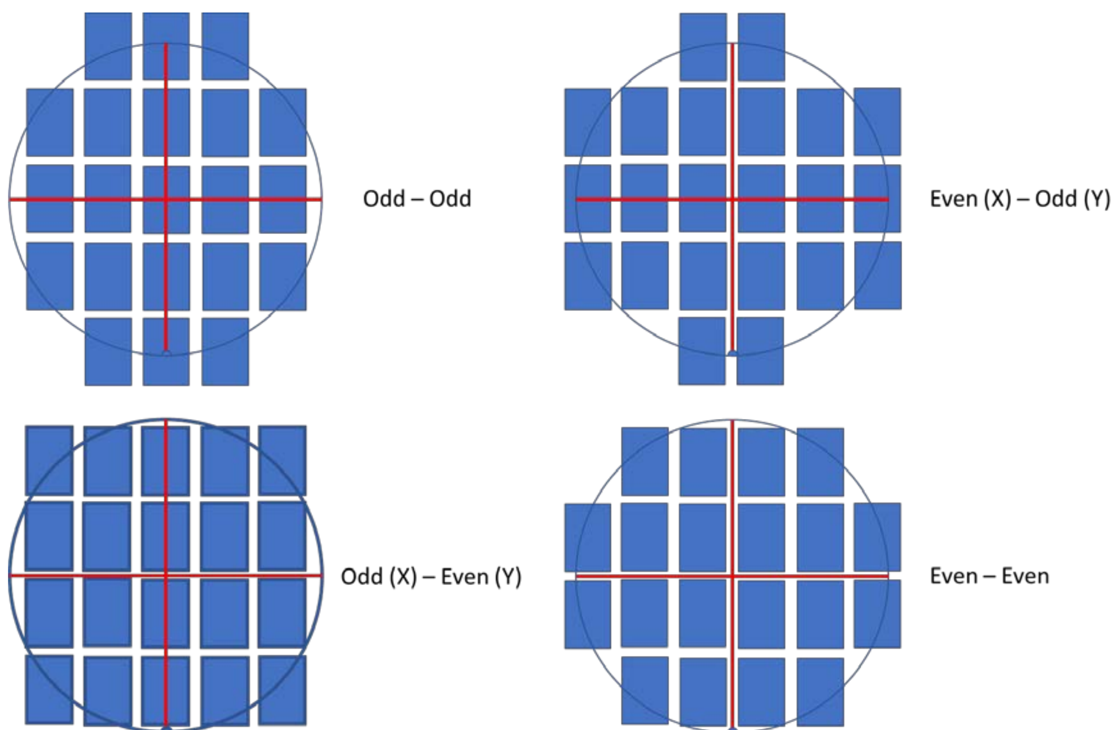

Figure 9 Different arrangements of shotmap

Part 4 – Payment Information

Payment Information

Please upload your purchase order *	Choose file No file chosen
I agree to the Terms and Conditions and I am authorised by my Organisation to do so *	☐
Do you have any comments?	

a). Please upload your purchase order.

Please upload the purchase order here.

b). I agree to the T&Cs and I am authorised by my Organisation to do so

Please agree to our T&Cs as well as confirm you have been authorised by your organisation to do so.

c). Do you have any comments?

Please leave any comments here.

Appendix 1 – Allowed Material

Due to the contamination control, we are currently only allowing the following materials in our advanced lithography tools:

Non-Metal

- Silicon
- Amorphous silicon
- Doped silicon
- Silicon dioxide (thermal, PECVD and sputtered)
- Silicon nitride (PECVD, LPCVD and hot-wire CVD)
- Germanium
- Doped germanium

Metals + metal based materials

- Aluminium
- Titanium
- Titanium nitride
- Chromium
- Nichrome
- Tantalum pentoxide
- Potassium Tantalate Niobate (KTN)
- Aluminium doped Zinc Oxide (AZO)
- Gallium nitride (GaN)
- Barium titonate (BTO)
- Indium Tin Oxide (ITO)

If your wafer contains different materials, please let us know before submitting a job to us as we need to assess the contamination risks.