



Kavli Nanolab Delft
Enabling nanodevice fabrication

Dear cleanroom user,

This is the 19th edition of **Kavli Nanolab News**. In this issue you can find news on the gowning procedure, announcement of our first annual user meeting and new functions on our e-beam lithography tools.

New gowning procedure

In order to reduce contamination risks some additional measures will apply as from June 1st. The new rules are described in a new version of the safety and behaviour rules Kavli Nanolab v.4.3, which can be found on the KN website for reference (<https://www.tudelft.nl/en/faculty-of-applied-sciences/about-faculty/departments/quantum-nanoscience/kavli-nanolab-delft/safety/>).

For III-V materials a special protocol is made and can be found in Annex 8 of the new document . It needs to be undersigned by all those working with III-V's.

Gowning procedure:

1st bench:

- PE gloves
- White hair cover
- Set of blue shoe covers (while passing the bench)

Area between benches:

- Mouth cap in case you have a beard and/or moustache.
- Cap over your head
- Coverall (note that sleeves should never touch the floor and that the cap is inside the coverall)

2nd bench:

- Cleanroom boots (while passing the bench)
- TNO key card underneath the cleanroom coat or covered by a disposable plastic bag.
- Changes PE gloves to nitrile cleanroom gloves

Leaving the cleanroom:

- follow the gowning procedure in reverse order
- return the boots sole-to-sole under the bench and hang the clothes with cap attached to the sleeves back in the coat-rack.
- take care that the sleeves of the coverall never touch the floor.
- final step is ALWAYS taking off the PE gloves and washing your hands

Taking materials in/out the CR:

- Sample boxes, tools or any other goods that go in and out the cleanroom need to be cleaned by IPA wipes in transport lock. Dirty wipes to be disposed in dedicated exhausted waste bin.
- Phones in the cleanroom need to be covered in a disposable plastic bag and go via the transport lock.
- Laptops are not allowed in the cleanroom unless you have permission by KN staff. Instead use tablets or the general purpose PC's in the cleanroom.

1st Annual Kavli Nanolab Cleanroom User Meeting

You are invited for the 1st Annual Kavli Nanolab User Meeting on July 3rd from 12:00 till 17:00 in the atrium of the VLL. Goal of this informal meeting is to create interaction between cleanroom users and discuss experience regarding all aspects of cleanroom activities. We invite you to submit a poster to highlight your nanotechnology work, for instance fabrication aspects, process developments, specific structures and/or devices or experience with process equipment. Unlike for other meetings we encourage to present failures so that we can learn from each other. Best poster and best optical or electron image will be awarded with a special price. Because the number of seats in the VLL is limited users who present a poster will get first priority to participate.

Registration is by email to Erika van Verseveld (F.G.vanVerseveld@tudelft.nl).

You will receive a template for the poster. After returning your poster design we will take care of printing it and mounting it on one of the poster boards.

Deadline for registration is June 21st.

Deadline for poster submission is June 29th.



Kavli Nanolab
1st annual cleanroom user meeting
Nanotechnology by and for the cleanroom users
3 July 2018 – in VLL Atrium

12:00-13:00 Registration and lunch
13:00-13:15 Welcome – Cees Dekker
13:15-13:30 Developments at KN – Frank Dirne
13:30-14:15 Atomic Layer Etching and Area Selective Deposition – Adrie Mackus (TU/e)
14:15-14:30 NEMS for quantum mechanical devices – Richard Norte
14:30-14:45 Interconnects for quantum devices – Alessandro Bruno
14:45-15:00 Developments in graphene processing – Sabina Caneva
15:00 Poster session (with drinks)
16:30 Best poster award and best micrograph award
17:00 End

Registration by email to f.g.vanverseveld@tudelft.nl
Limited number of seats, poster presenters have 1st priority

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News on EBPB functions

In e-beam writing the optimized spot size depends, via column and filament settings and properties, on the beam current and selected final aperture. In April, the “fegmode estimate” command has been updated, and various graphs showing estimated spot sizes as function of beam current for the selectable beams are available via the “Estimated spot size” link in the online EBPB Help manuals.

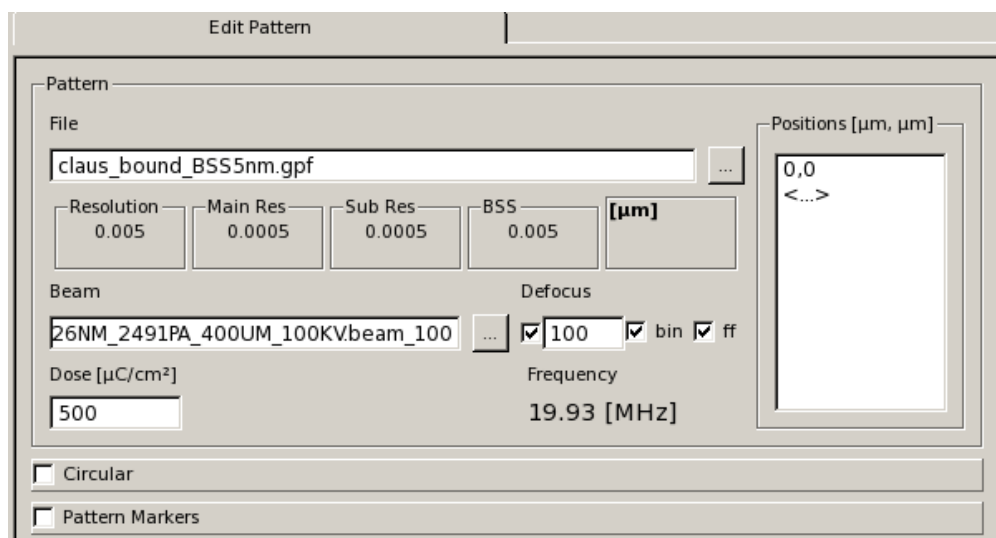
The actual writing frequency depends on beam current, beam step size and dose needed for your exposure. For sensitive resists, in cases where the writing frequency would exceed 100MHz, or for single dot exposures of specified size, spots can be defocused (made larger by deliberately setting out of focus) using the final lens. Defocusing can be done by specifying a resulting measured spot size, or by specifying the number of bits (“binary”) the final lens has to be set “wrong”. Since March, the job conversion executed when starting (“job”) or queueing (“batch”) a cjob *.job file, also mentions the estimated size of the binary defocused spot:

```
Re-converting jobfile "/home/pg/users/vanrun/jobs/defocus_FL80bits.job":  
  
beam "26NM_2491PA_400UM_100KV.beam_100" available  
beam "26NM_2491PA_400UM_100KV" defocussed by 80 FL bits will be around 97.7 to 98.4 nm  
pattern "claus_bound_BSS5nm.gpf" available  
pattern "claus_bound_BSS5nm.gpf" available  
  
Re-converted <cjob_script> /home/pg/users/vanrun/jobs/defocus_FL80bits.job because of new converter version
```

The BEAMS machine control software, that also contains the “cjob” writing job definition and execution software, is under continuous development by Raith, to solve bugs and add new functionality, among others offered by the flexibility of the built-in Universal Pattern Generator hardware.

On the EBPB5000Plus, we already have the latest BEAMS version, but, as there still are some problems, this is not yet installed on the heavier used EBPB5200. BEAMS goodies already available on the EBPB5000Plus are:

- revised call of user-defined marker search routines; now our routine is also called for all mixed marker types (e.g. JOY and RP20) at the Exposure level
- marker creation and marker search parameter setting from within cjob
- defocusing via fine focus (“FF”) too, which is faster (no settling) and in smaller steps (0.7 nm/bit vs. 20 nm/16 bits) at the cost of height compensation range:



the Pattern window in cjob, and what is printed when batching:

```

Checking validity of jobfile "/home/pg/users/vanrun/jobs/defocus_FF100bits.job":

beam "26NM_2491PA_400UM_100KV.beam_100" available
beam "26NM_2491PA_400UM_100KV" defocussed by 100 FF bits will be around 72.7 to 73.7 nm
pattern "claus_bound_BSS5nm.gpf" available
pattern "claus_bound_BSS5nm.gpf" available

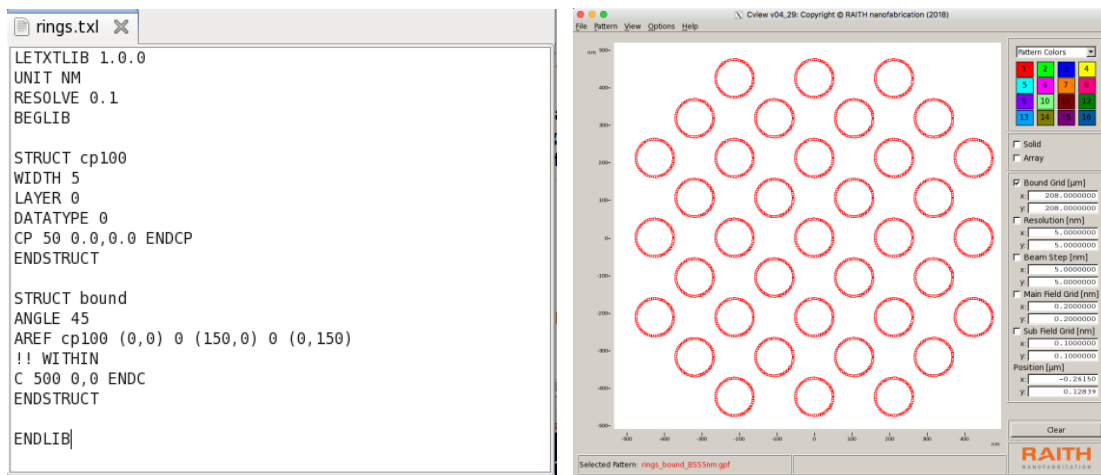
Just confirmed validity of <job_script> /home/pg/users/vanrun/jobs/defocus_FF100bits.job

```

- image grabbing and the hereon based marker search (i.e. JOYIMG type) no longer hang up the control computer

In order to increase the chance that a batched job actually can execute without errors, and that users can easily change machine and marker search parameters, in the course of time various checks and ways of changing settings have been implemented and will be further extended and improved if necessary.

The latest development in the txl2gpf tool to generate high resolution patterns like circles is the possibility to create an array of patterns where the array grid is bound by a circle:



Please contact Arnold van Run for more information, suggestions and wishes.

NanolabNL Vouchers

A voucher for the free use of the NanoLabNL facilities can be directly applied for at the program office of NanolabNL. A NanoLabNL voucher has a value of 7500 euros and gives the user the right to 60 hours of independent use of the facilities of the nanotechnology labs (including training) and/or advice about this. The vouchers are intended for industrial parties who have not previously made use of NanoLabNL's facilities.

See also <http://www.nanolabnl.nl/facilities/voucher-free-use-of-facilities>

Maintenance week VLL

The facility maintenance week will be in week 26. This means that the cleanroom will be closed for processing from 25-06-2018 07:00 till 28-06-2018 17:00.