



This document contains the confidential and proprietary information of Nanotronics Imaging, Inc. Neither this document nor any of the information contained is to be reproduced, distributed, used or disclosed, either in whole or in part, except as specifically authorized by Nanotronics Imaging, Inc.

nSpec Version 0.21.0.0

Release Date: 31 Oct 2021

Documentation Updated: 09 Sep 2022

Major Features: Bare Wafer Alignment, GDS Layout Creation

- [Overview](#)
- [Upgrading to v0.21.0.0](#)
 - [Autoloader Laser Amplifier Sensor](#)
 - [Live View Frame Rate](#)
 - [Precision Scan Automatic Lighting](#)
- [Major Enhancements](#)
 - [Bare Wafer Alignment](#)
 - [Overview](#)
 - [Enabling Bare Wafer Alignment](#)
 - [Before Creating a Bare Wafer Alignment File](#)
 - [Creating a Bare Wafer Alignment File](#)
 - [Bare Wafer Alignment Wizard Settings](#)
 - [Measurements Taken During Bare Wafer Alignment](#)
 - [GDS Layout Creation](#)
 - [Overview](#)
 - [Steps to Import](#)
- [New Features](#)
 - [Highlights](#)
 - [Manual Color Balancing:](#)
 - [Air Knife Integration:](#)
 - [Hardware upgrade required, If you are interested in an Air Knife upgrade, please contact us at \[sales@nanotronics.co\]\(mailto:sales@nanotronics.co\)](#)
 - [Reporting Class View Settings:](#)
 - [Manual Set Z Focus Type:](#)
 - [OCR Disable Scribe Reading Job Property:](#)
 - [ManualLoadWafer Job Property:](#)
 - [Analysis JSON Export Parameter:](#)
 - [SECS/GEM Upgrades:](#)
 - [General Improvements](#)
 - [Scanning Improvements](#)
 - [Analysis Improvements](#)
 - [Autoloader Improvements](#)
 - [New Features Changelog](#)
- [Bug Fixes](#)
 - [Changelog](#)

Overview

Upgrading to v0.21.0.0

Required Library Update

To get the latest installer to upgrade to v0.21.0.0, please contact Nanotronics Technical Support at support@nanotronics.co.

During the upgrade process, please review the following adjustments that may need to be changed to perform a smooth upgrade:

Autoloader Laser Amplifier Sensor

Important for all nSpec PS systems

nSpec v0.21.0.0 treats the autoloader laser amplifier settings differently than before if an IG-010 Keyence sensor is present in the autoloader. It is very important for safe wafer alignment to update the following settings on the alignment laser module if an IG-010 Keyence sensor is present. Additionally, the sensor will have to be flashed using the TStoolkit (WhatScopeDoIHave).

On the laser amplifier sensor hardware (located inside the autoloader near the aligner), set the following:

1. AnH = 0
2. AnL = 10

 Note: The AnH and AnL settings are reversed compared to previous versions of nSpec.

Then, within nSpec, update the following:

 Program Options > Autoloader > *Invert Aligner Sensor Readings set to "0"*

For additional instruction on how to safely update these settings, please reach out to Nanotronics technical service at support@nanotronics.co

Live View Frame Rate

Within nSpec Program Options, under Camera settings, set GenICam Acquisition Frame Rate Limit to 30 fps. By default, this new parameter is set to 60 fps, however this value needs to be lowered, especially for newer Bonita cameras that capture very large images. Additionally, in Live View settings, set Frame Refresh Limit (FPS) to -1. This will instruct the live view to capture images as fast as the camera allows.

Precision Scan Automatic Lighting

To run precision scans with any form of auto-light adjustment (masked or unmasked), as of v0.21.0.0 you must now verify that the Auto checkbox in the job's image group settings is checked for the light you want to adjust.

Major Enhancements

Bare Wafer Alignment

- [Overview](#)
- [Enabling Bare Wafer Alignment](#)
- [Before Creating a Bare Wafer Alignment File](#)
- [Creating a Bare Wafer Alignment File](#)
- [Bare Wafer Alignment Wizard Settings](#)
- [Measurements Taken During Bare Wafer Alignment](#)

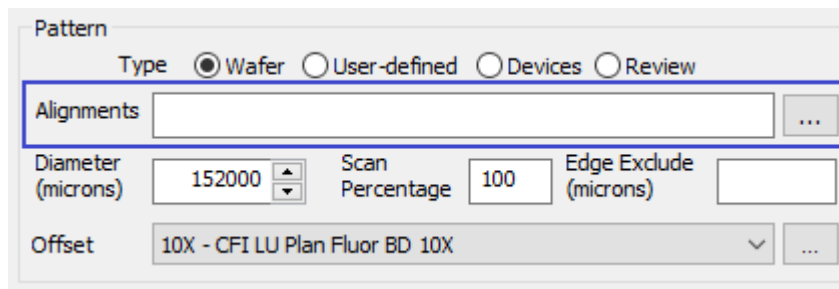
Overview

nSpec supports alignment of bare wafers. Bare Wafer Alignment uses an automatic fiducial detection algorithm to find the angle of any wafer (bare or patterned) relative to the stage.

Enabling Bare Wafer Alignment

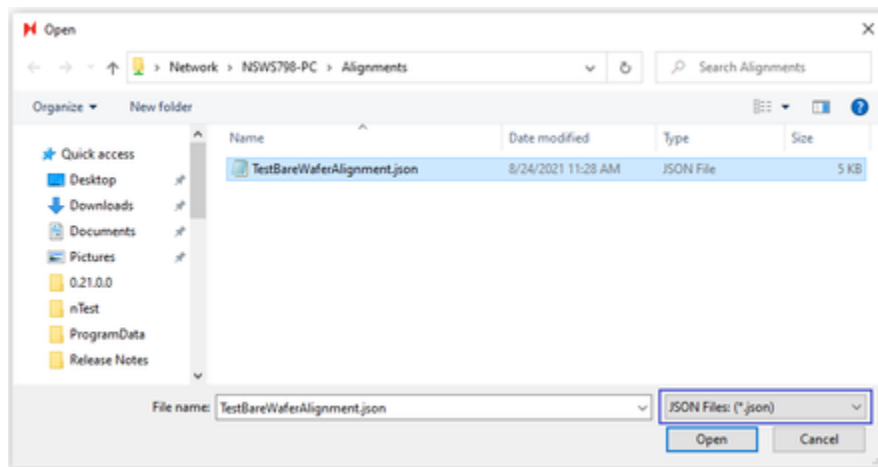
A new Alignments field for Wafer patterns in the Scan Settings dialog has been added to accept both the tradition Device Inspection Alignment files (.csv) and the new Bare Wafer Alignment files (.json).

1. Alignment will be enabled if this field has a valid alignment file
2. Alignment will be disabled if this field is left blank



The image shows the 'Pattern' section of the Scan Settings dialog. The 'Type' is set to 'Wafer'. The 'Alignments' field is highlighted with a blue border and contains a file selection button (three dots). Below it, the 'Diameter (microns)' is 152000, 'Scan Percentage' is 100, and 'Edge Exclude (microns)' is empty. The 'Offset' is set to '10X - CFI LU Plan Fluor BD 10X'.

New Alignments field in Scan Settings Dialog



Bare Wafer Alignment (JSON) file selection

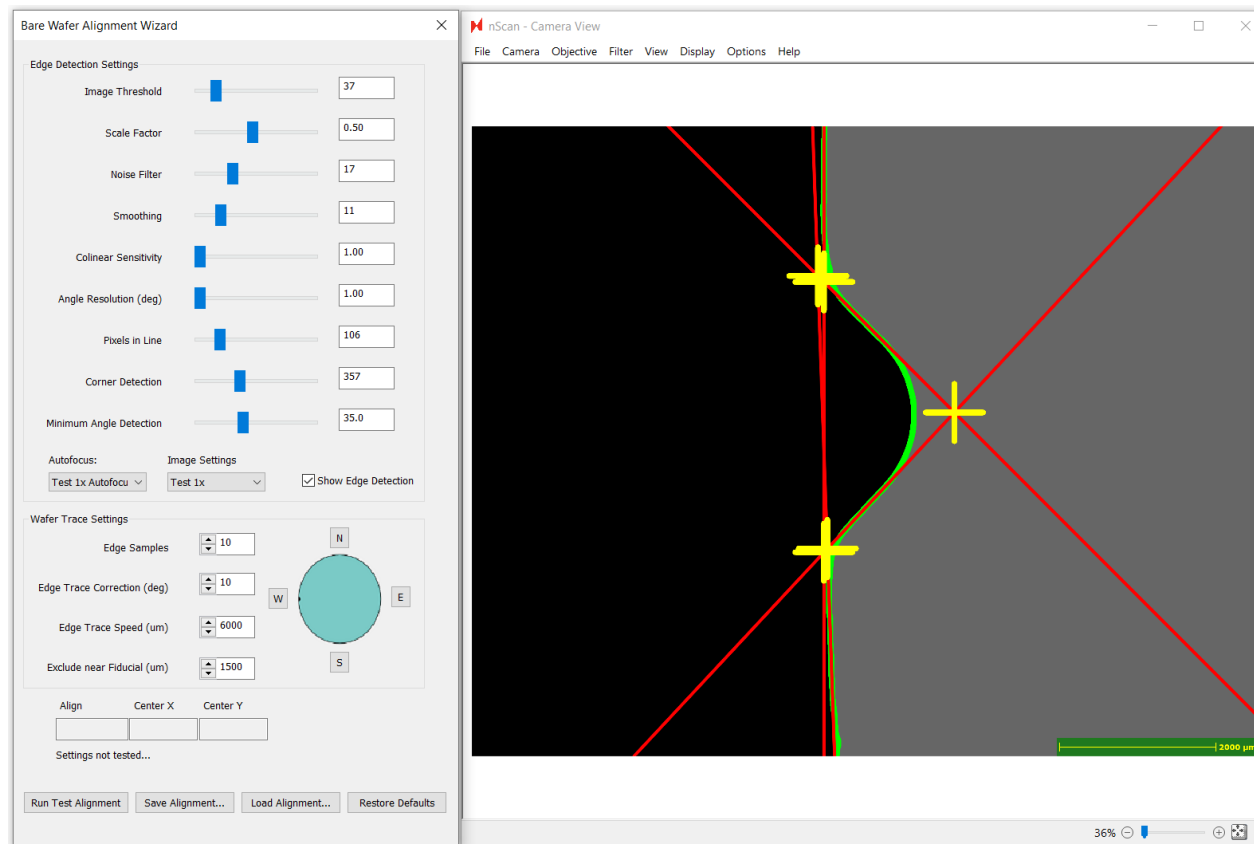
Before Creating a Bare Wafer Alignment File

Prior to creating a Bare Wafer Alignment file, do the following:

1. Place a representative wafer on the stage
2. Create an image settings group with low magnification (i.e., 1x, 2.5x, or 5x should all work)
3. Create an autofocus group with Use F-stop set to 0
4. Navigate to the wafer's fiducial (i.e., flat's corner or notch) so that it is centered in the live view

Creating a Bare Wafer Alignment File

To create a Bare Wafer Alignment file, navigate to the Bare Wafer Alignment Wizard through Stage View Scan Bare Wafer Alignment Start Wizard:



The Bare Wafer Alignment Wizard (on the left) will appear, and the live view (on the right) will automatically have Edge Detection enabled. When enabled, Edge Detection will display the following highlights in the live view:

Color	Description of Meaning
GRAY	Wafer area
BLACK	Stage area
GREEN	Wafer edge
BLUE	Other contours
YELLOW CROSS	Indicates detection of a fiducial's corner

RED LINE	Indicates how lines are detected
-----------------	----------------------------------

The goal of this alignment setup is to optimize the settings in the Bare Wafer Alignment Wizard so that only the corners of the target fiducial have yellow crosses on them. You can then click Run Test Alignment to test the assigned settings. Once satisfied, you can click Save Alignment... to save the alignment.

Bare Wafer Alignment Wizard Settings

Setting	Description	Recommendation
Image Threshold	Determines which part of the image is wafer vs stage.	20 is usually good.
Scale Factor	Determines scaling of the image for processing.	Lower is faster but can create reduce precision. 0.3 - 0.5 is recommended.
Noise Filter	Applies a blur filter to reduce noise.	Use this and Smoothing to remove excess contours and make sure the edge of the wafer is continuous.
Smoothing	Applies morphological closing to fill holes.	Use this and Noise Filter to remove excess contours and make sure the edge of the wafer is continuous.
Colinear Sensitivity	For placing the red lines used to find corners. Determines how straight the lines must be to be considered a line.	Lower is stricter.
Angle Resolution (deg)	For placing the red lines used to find corners.	Lower results in more lines but can be slower.
Pixels in Line	The number of pixels used to find the line.	If the fiducial isn't being found reliably, lower this value. If it is too low, false positives can result in other parts of the wafer being found as a fiducial
Corner Detection Sensitivity	The distance allowed for the corner detected to be from the edge.	Keep as low as possible.
Minimum Angle Detection	The minimum angle between red lines that identifies a corner.	For notch wafers, 35° is usually a good choice. For flatted wafers, 15° is pretty good.
Autofocus	Autofocus group to use when alignment starts.	

Image Settings	Image settings to use during alignment.	
Edge Samples	Number of samples to take along the edge.	More will be more accurate but slower. At least 6 is recommended.
Edge Trace Correction (deg)	Angle the stage movement takes when moving to the next sample.	Adjusting this can help track the edge better.
Edge Trace Speed (um)	Distance the trace will move at each stage instruction.	Lower will be slower, but more reliable. For nSpec systems with higher FPS, this can be higher. For nSpec systems with lower FPS, set this to 0.
Exclude near Fiducial (um)	Distance a point must be from the fiducial to be used for center calculations.	Increase if the fiducial is being included in edge calculations.
Wafer Alignment	Four buttons N, S, E, W for selecting where the fiducial is supposed to be aligned.	Align angle result will be the rotation needed to align the wafer with that point.

Measurements Taken During Bare Wafer Alignment

Certain wafer properties measured and calculated during Bare Wafer Alignment will be automatically written to the database. These property values can also be manually input as job properties, **and manual inputs will overwrite the values obtained from running Bare Wafer Alignment in the database.**

Running Bare Wafer Alignment will calculate and write the following values to the database.

Scan Property	Description
SampleOrientationMarkType	Notes the wafer fiducial type, Notch or Flat. *When using the autoloader and performing a bare wafer alignment, if a flat is not found, the scan property value is automatically determined to be a Notch. If Bare Wafer Alignment is not performed at all, the value is NA.
OrientationMarkLocation	Notes the orientation of the wafer fiducial, North, South, East or West. If there is more than one orientation mark, this value will mark the orientation of the larger of the two orientation marks (e.g. if there are two flats, this value denotes the major flat location.) If in the rare case there are multiple marks of the same size, this value denotes the first mark found during alignment.

WaferCenterX	X axis value that marks the center of the wafer, relative to the stage origin (top left corner).
WaferCenterY	Y axis value that marks the center of the wafer, relative to the stage origin (top left corner).
OrientationMarkLength	Micron measurement of each flat. If there are multiple marks, the value written to the database will be a comma separated value of the mark lengths in descending length.

GDS Layout Creation

- [Overview](#)
- [Steps to Import](#)

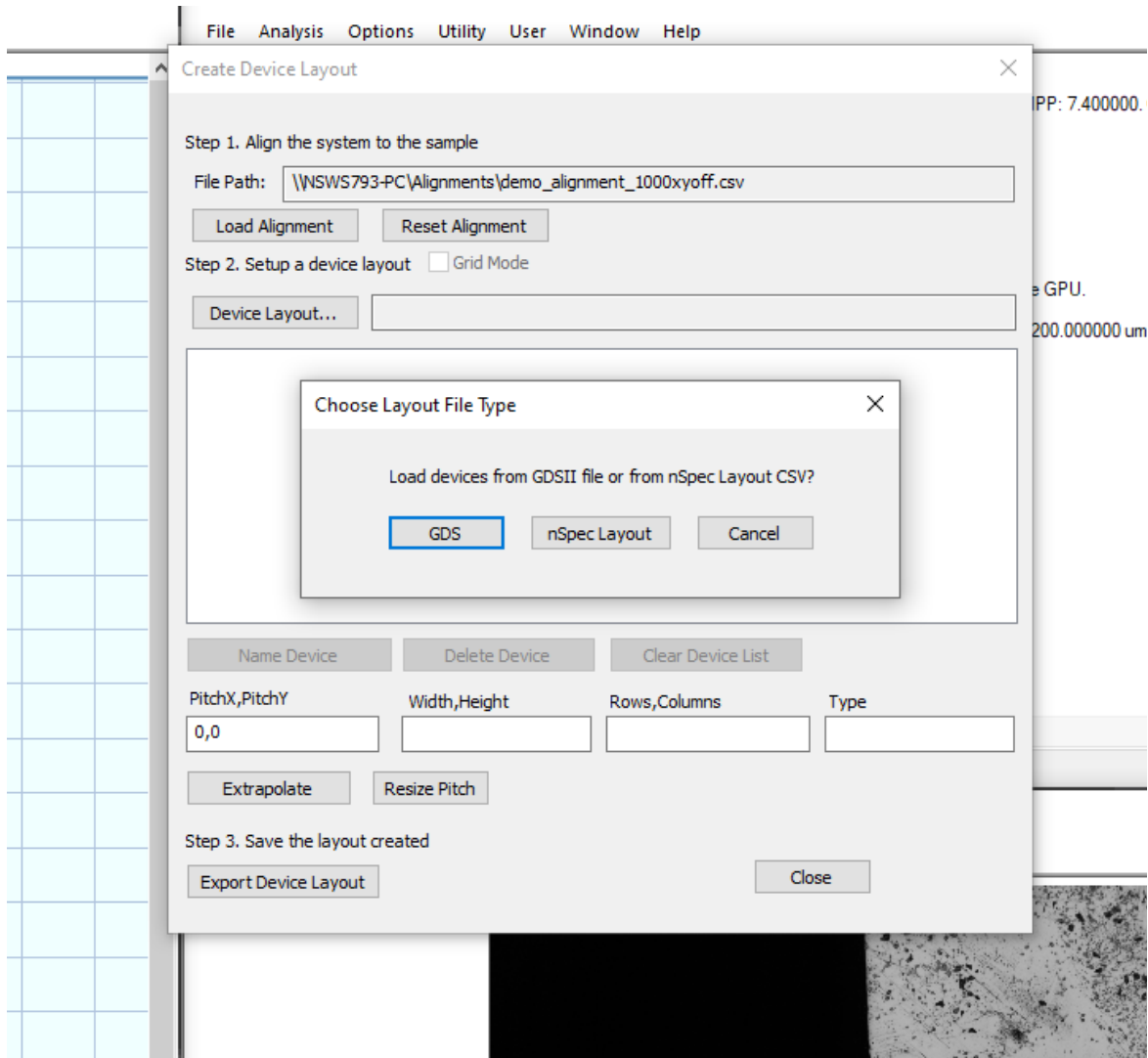
Overview

nSpec now supports nSpec device layout creation using Graphic Data System (GDS) files.

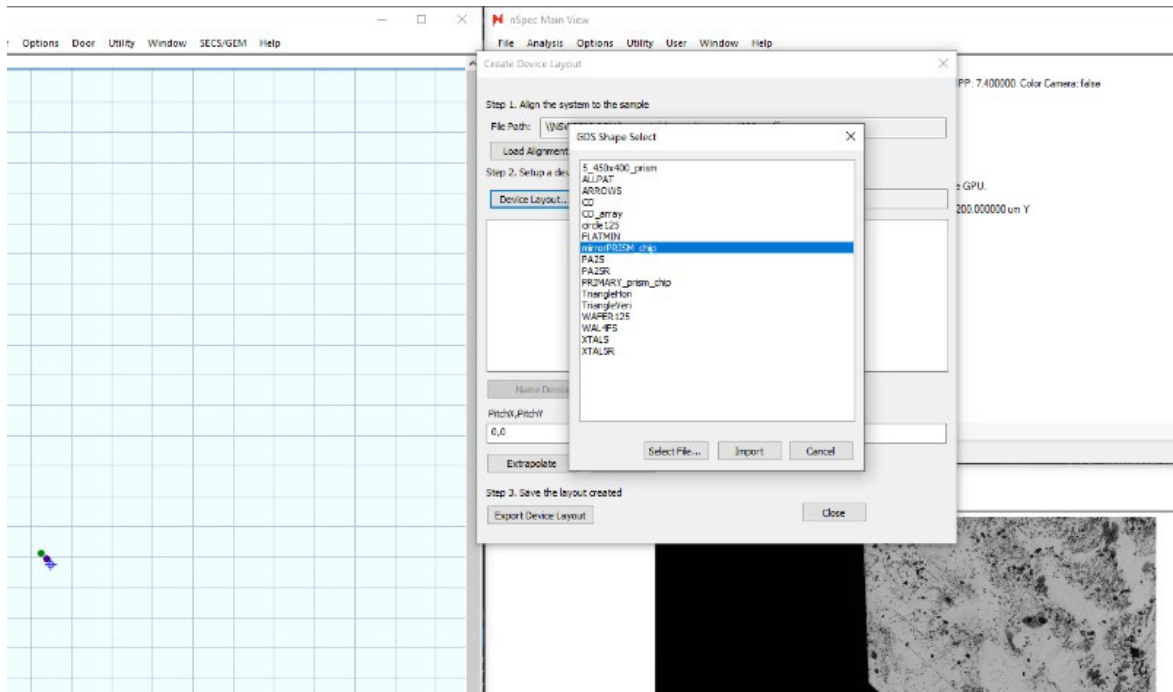
Steps to Import

To convert a GDSII file into an nSpec Layout file:

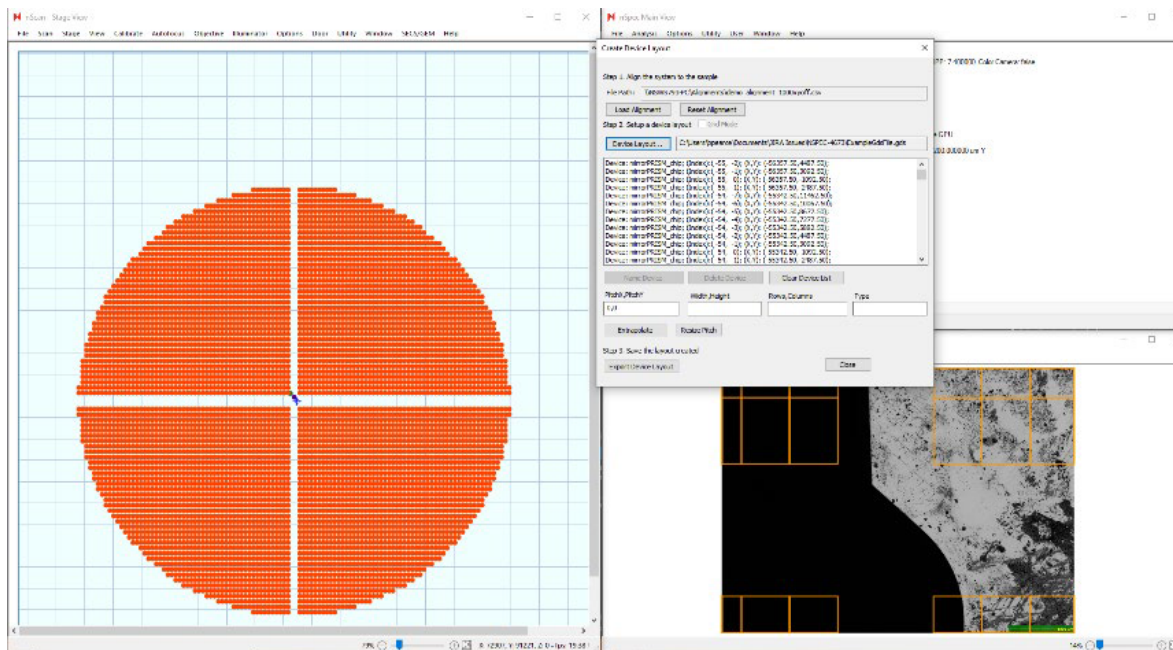
1. Create a Device Inspection Alignment where the origin is the location of the GDSII file's origin
2. Go to Stage View Create Device Layout
3. Click Alignment... and load your created alignment
4. Click Device Layout... (which will open a new Choose Layout File Type dialog)
5. Click GDS



6. Chose the desired layer and click Import



- The device structure corresponding to the selected layer will be populated in the stage view and the device list, as if the devices were specified through extrapolation. At this point, the device layout the same as a traditional nSpec device layout.



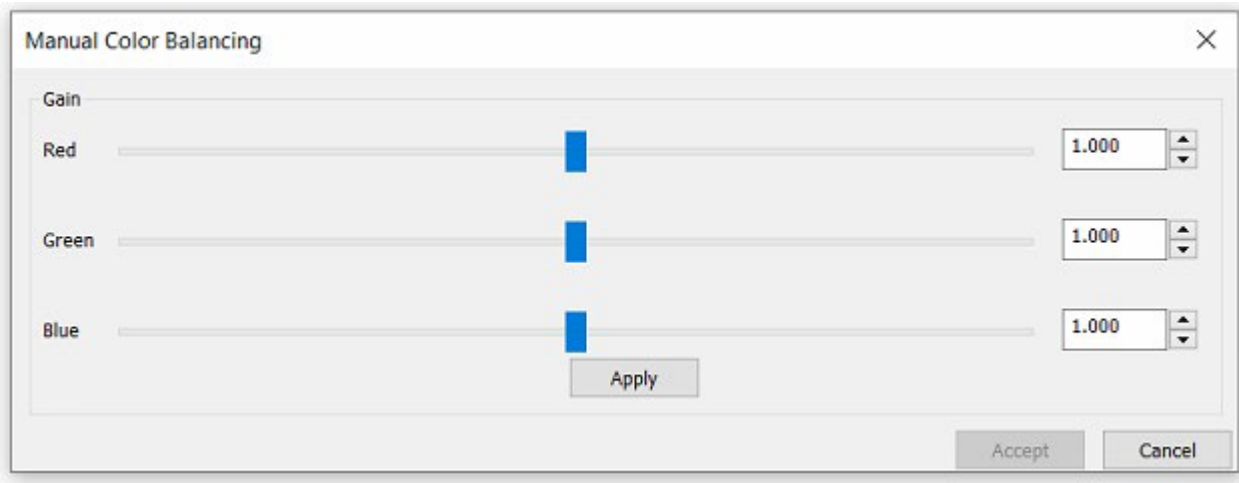
New Features

Highlights

Manual Color Balancing:

i Only relevant for nSpec systems with a color camera

nSpec now supports manual flat-field color balancing. To enable this option, set the Flat Field Correction Manual Color Balance program option under the Camera category to 1. When enabled, whenever calibrating objectives through Stage View Calibrate Calibrate Objectives, the following dialog will open:



Within this dialog, the user can change the sliders for each color channel (Red, Green, and Blue for color cameras or Luminance for non-color cameras). Clicking Apply will cause flat field correction to happen, with the current slider values being applied to each channel. When correction has completed, the dialog will reopen. This allows the user to keep changing the balance until the desired effect is achieved. Once the desired balance has been found and applied, the user can select Accept to keep these changes. Otherwise, the user can click Cancel or end the dialog via the X button at the top and the system will run flat field calibration again with the color balance settings from when the first dialog was originally opened.

Air Knife Integration:

⚠ Hardware upgrade required, If you are interested in an Air Knife upgrade, please contact us at sales@nanotronics.co

nSpec can now clean Olympus turret objectives through the integration of the Air Knife hardware. To clean objectives using the Air Knife hardware:

1. Connect the Air Knife to an open USB port on the tool's computer
2. Set Number of Objective Slots under Hardware: Turret Control to the number of physical objective slots available on the turret
3. Set Turret Switching Delay (ms) under Hardware: Turret Control equal to or more than the time it takes for one objective slot position to change
4. Start nSpec
5. Select Stage View Utility Clean Objectives

The *Clean Objectives* routine will do the following:

1. Move stage out of the way (so samples do not get shot with air/nitrogen)
2. Turn on air & nitrogen
3. Rotate nosepiece (turret) 1 full revolution (360 deg)
4. Turn off air & nitrogen
5. Return stage and objective to position before air knife job was started

Reporting Class View Settings:

Two new program options under the Reporting Class View category have been added to set the starting underlay and bin colors for class view reports: Default Underlay and Defect Bin Colors respectively. Furthermore, the first bin's color is no longer a monochromatic gray.

Manual Set Z Focus Type:

A new autofocus type has been introduced: Manual Set. When selected, autofocus routines will simply set the stage's Z position to the value specified in Initial Z Position in Autofocus Settings.

OCR Disable Scribe Reading Job Property:

Users can now enable/disable OCR scribe reads without changing the Autoloader program option via the job property: DisableOCR.

ManualLoadWafer Job Property:

The ManualLoadWafer job property now accepts two additional arguments: Z and Objective Slot. ManualLoadWafer can be used to set the state of the stage and turret after a job is finished.

 The syntax for ManualLoadWafer is the following:

[X],[Y],[Z],[Slot #]

The following are possible arguments for the ManualLoadWafer job property:

Variable	Description
X	Stage X position after job has finished
Y	Stage Y position after job has finished
Z	Stage Z position after job has finished
Slot #	Target objective slot after job has finished (slots are defined in Camera View Objective Define Objectives)

The possible ManualLoadWafer job property combinations are as follows:

Variable	Description
[X],[Y]	Sets stage X,Y position after job has finished
[X],[Y],[Z]	Sets stage X,Y,Z position after job has finished
[X],[Y],[Z],[Slot #]	Sets stage X,Y,Z position and objective slot after job has finished

Analysis JSON Export Parameter:

Analyses that export JSON files now have a parameter to enable/disable JSON exports: Export JSON.

SECS/GEM Upgrades:

JIRA ID	Description
NSPEC-4738	Added event and variable for failed acknowledgements
NSPEC-4737	Updated handling of cassette scan command
NSPEC-4711	Added ability to run empty sample IDs
NSPEC-4710	Added debug logs to custom messages
NSPEC-4649	Added abort complete event
NSPEC-4601	Added ability to abort a scan based on read OCR scribe
NSPEC-4466	Added variable for alignment errors
NSPEC-4647	Updated ACKs for failed START_SCAN command
NSPEC-4460	Fixed bug where host would hang after an invalid job name was sent
NSPEC-4404	Added error handling for empty job name request
NSPEC-4341	Added ability to turn off all lights
NSPEC-4340	Added ability to set X,Y,Z stage position and objective slot
NSPEC-4242	Added ability to cancel queued analysis when STOP_JOB message is sent
NSPEC-4822	Added program option to enable/disable OCR read wafer ID alarms

General Improvements

JIRA ID	Description
NSPEC-5159	Fixed a bug where auto light adjustment would not properly adjust light when using the Stage Calibration and Repeatability dialog
NSPEC-4473	GenTL errors during Bonito camera initialization are now printed in the exlog
NSPEC-4589	The Home and End keys on a keyboard now control the stage's Z movement when the Camera View window is focused
NSPEC-4626	User can now disable the GenICam Region of Interest program option
NSPEC-4432	Fixed a bug where autofocus would fail during a video sweep
NSPEC-4223	Fixed a bug where the live view selection tool (creates red box when pressing CTRL + Drag) would incorrectly place selection box.

NSPEC-4743	Increased Bonito cameras FPS to a maximum of 60 FPS (as of v0.21.0.0, 30 FPS is recommended)
----------------------------	--

Scanning Improvements

JIRA ID	Description
NSPEC-4734	Improved throughput of flat-field image correction on Euresys capture card
NSPEC-4651	Improved path planning for Defect Review scans
NSPEC-4687	Tiles in a Wafer scan do not shift laterally when live view is minimized
NSPEC-4624	Tiles in a Device Inspection scan are not disconnected
NSPEC-5153	Precision scans on large devices are supported on nSpec systems with Bonito 2620 cameras

Analysis Improvements

JIRA ID	Description
NSPEC-4357	Moved Gen4 analysis connection issue logs from exlog to debug log
NSPEC-4752	Throughput of Device Inspection analysis running on GPU is improved
NSPEC-4748	Defect counts are properly calculated when edge exclusion is applied
NSPEC-4669	Database write times for defect exports are improved
NSPEC-4609	Fixed a bug where GPU with Padding > 0 would not do template alignment correctly for Device Inspection analyses
NSPEC-3768	Fixed inconsistencies in defect count when masking for Gen3 AI analysis
NSPEC-4485	Fixed a bug where Device Inspection analysis would hang for very large device when run with GPU
NSPEC-4431	Fixed a bug where Gen4 analysis would disconnect in the middle of processing many images

Autoloader Improvements

JIRA ID	Description
NSPEC-5141	Removed program option Invert Aligner Sensor Readings under Autoloader has been removed. Ensure your autoloader's aligner laser settings AnL & AnH settings are 10.0 & 0.0 respectively so alignment works properly

NSPEC-4496	Fixed ability to use Map Sensor with original autoloader's alignment algorithm (Autoloader with faster alignment = 1)
NSPEC-4768	Fixed sanity error due to unstable spinner alignment velocity
NSPEC-4694	Calibration dialog buttons Set Spinner Speed & Set Alignment Speed renamed to Set Spinner Alignment Speed & Set Spinner Find Speed respectively, which control database entries Spinner Alignment Speed & Spinner Notch/Flat Find Speed respectively
NSPEC-4603	Added error handling to Autoloader 3's Manual Control dialog
NSPEC-4398	Added OCR camera integration to Autoloader 3
NSPEC-4397	Add option to use and switch between second load port in Autoloader 3
NSPEC-4462	Added Quartet pre-aligners Integration to Autoloader 3
NSPEC-4399	Added lift-pin chuck Integration into Autoloader 3's stage load routine

New Features Changelog

T	Key	Summary
	NSPEC-5186	Remove Align All Autoloader Button
	NSPEC-5141	Remove Invert Aligner Program Option
	NSPEC-5102	Clear Bare Wafer Alignment Points on Wizard Exit
	NSPEC-5036	Change bare wafer alignment default orientation to "south"
	NSPEC-4998	Replace time-based termination condition by math-based one, in calibration reversal function
	NSPEC-4866	Improve speed in DI analysis on GPU
	NSPEC-4822	Make Program Option for SECS/GEM OCR Read Wafer ID Alarms
	NSPEC-4791	Improve LiveView Frame Rates
	NSPEC-4784	Increase Frame Rates in CS and DI scans
	NSPEC-4782	Fix SQL statements which require parsing in multiple stages
	NSPEC-4779	Changes to column labels in the CSV export caused downstream customer script to break

- NSPEC-4774 Wafer prediction contour and radius exports are mutually exclusive, and some customers want both
- NSPEC-4771 Integrate Detection of Euresys Flat-Field Capabilities on Card
- NSPEC-4768 Failed prealigner sanity check shall go to retry
- NSPEC-4767 Increase Limits of Z Correction Range
- NSPEC-4752 Improve throughput for DI analyses on GPU
- NSPEC-4743 Increase Framerate for GeniCam (Bonito) cameras
- NSPEC-4738 Add SECS/GEM Event and Variable for Failed Acknowledgements
- NSPEC-4735 Rationalize threading in CStageSampleView
- NSPEC-4734 Improve throughput of image correction when flatfielding has been done on the capture card
- NSPEC-4712 Update Manual Config Autoloader Window to Use Previous Settings
- NSPEC-4711 Add Ability to Run Empty Sample IDs on Cassette Scans Locally and via SECS/GEM
- NSPEC-4710 Add Debug Log Messages to Custom SECS/GEM Messages
- NSPEC-4673 Make GDS Files Importable into nSpec for Layout Creation
- NSPEC-4651 Improve Path Planning for Defect Review Scans
- NSPEC-4650 Add ability for turn on/off OCR scribe reading
- NSPEC-4649 Add Abort Complete Event For SECS/GEM
- NSPEC-4647 Update ACKs in SECS/GEM To Send on Failed START_SCAN Command
- NSPEC-4642 Add Git Hashes to License Info
- NSPEC-4638 Add ability to run defect review scans from Analyses in ImageDB

- NSPEC-4635 Add Air Knife Oxygen and Nitrogen Controller Class

- NSPEC-4634 Utility Updates for Air Knife

- NSPEC-4632 Auto-detection of Air Knife Hardware

- NSPEC-4625 Add logging to convergence test of XY reversed transform

- NSPEC-4619 Allow use of Stage View while wizard is open

- NSPEC-4616 Add data to dislocations analyzer export

- NSPEC-4613 Sparta: Force Down Vortex Plate After Alignment

- NSPEC-4612 Improve trace speed and fiducial detection

- NSPEC-4610 Multi-GPU support for Gen3

- NSPEC-4608 Sparta Tool Extra Vacuum Off Delay for Prealigner and Stage

- NSPEC-4606 Sparta Tool Cannot Set Different Angles For OCR and For Stage

- NSPEC-4603 Add Error Handling to Autoloader3 Manual Control Dialogs

- NSPEC-4601 Scan Continue/Abort over SECS/GEM

- NSPEC-4597 Improve calculation of KMeans points

- NSPEC-4595 Add ability to abort AdjustToEdge function

- NSPEC-4594 Make Edge Detector capable of detecting the corner points on the whole fiducial

- NSPEC-4592 Wrap file IO to allow use of larger buffers

- NSPEC-4589 Use arrow key combination to control z movements

- NSPEC-4585 Manual Set Z Focus Type

- NSPEC-4583 Make Text Boxes in Bare Wafer Alignment Wizard editable

- NSPEC-4578 Ensure tile overlap is handled correctly in nView

- NSPEC-4575 Add ability to select JSON files in Scan Settings dialog

- NSPEC-4560 Manual Flat-field Balancing UI Updates

- NSPEC-4559 Update Flat-field Algorithm For Manual Balancing

- NSPEC-4558 New Parameter in CameraConfig Files (and White Balance info)

- NSPEC-4479 nSpec Should Be Able to Update the Z and Turret Positions in the ManualLoadWafer Job Property

- NSPEC-4472 Make Automatic Light adjustment optional for Precision scans

- NSPEC-4466 nSpec Should Notify SECS/GEM Operators of Alignment Errors

- NSPEC-4462 Integrate Quartet pre-aligners to Autoloader 3

- NSPEC-4460 nSpec Should Be Able To Continue After an Invalid Job Name is Sent via SECS/GEM

- NSPEC-4455 Add ability for user to disable JSON export

- NSPEC-4399 Integrate lift-pin chuck into Autoloader 3 stage load routine

- NSPEC-4398 Add OCR camera integration to Autoloader 3

- NSPEC-4397 Add option to use and switch between second load port in Autoloader 3

- NSPEC-4391 Remove Pseudo-Color functionality in nScan, nView and nViewMulti

- NSPEC-4386 Missing Nanotronics Logo On Some Executables

- NSPEC-4379 Set default reporting options to preferred values

- NSPEC-4357 Move gen4 AI debugging messages from exlog to nDebug

- NSPEC-4352 Update description for Optional Custom Analysis Flags in DI analysis parameters

NSPEC-4341	nSpec Should Be Able to Turn Off All Lights Over SECS/GEM
NSPEC-4340	nSpec Should Be Able to Set X,Y,Z Stage Positions and an Objective Over SECS/GEM
NSPEC-4324	Add alignment wizard for bare wafer alignment (fiducial and edge detection)
NSPEC-4322	Add wafer alignment routine (fiducial and edge detection) to find wafer center and angle of rotation
NSPEC-4242	nSpec Should Be Able to Cancel Queued Analyses When SECS/GEM Commands A STOP_JOB Message
NSPEC-4030	Enable ability to save class report settings like count and size report
NSPEC-3776	Implement controller EA-1467 to manage enclosure door locks and integrate into scanning pipeline
NSPEC-3445	Export the cropped defect images as color images
NSPEC-3361	Defect class report image annotation color should match class bin color

78 issues

Bug Fixes

Changelog

T	Key	Summary
	NSPEC-3662	Auto light adjustment can result in an infinite loop
	NSPEC-3768	Masking for Gen3 AI analysis is inconsistent and does not mask properly.
	NSPEC-3795	Switching to Precision Scan Mode multiply the menu in Autofocus Setting pop up.
	NSPEC-3840	Defects Review Scan Pattern crashes after Focus points routine
	NSPEC-3867	nSpec crashes when View drop-down menu is selected
	NSPEC-3979	Inline analysis on DI doesn't start

	NSPEC-4034	Failure to generate DI Analysis csv Report for Large Devices
	NSPEC-4133	Scratch count of Crack Analysis V2 is calculated incorrectly
	NSPEC-4138	Calibration utility doesn't perform auto light adjustment during FF correction routine
	NSPEC-4173	DI Inline Analysis fail before completing
	NSPEC-4223	The selection tool for an image in the Camera View is broken
	NSPEC-4246	Create Device Layout dialog loses focus after uploading alignment file
	NSPEC-4249	Parameters Description text field is not updated when loading Select Analysis dialog
	NSPEC-4280	Lagrangian Interpolation (PreFoc Polynomial) Standard algorithm doesn't work for DI scans
	NSPEC-4351	Gen4 Defects per image Parameter not working
	NSPEC-4355	Gen IV AI Analysis on DI scans fail when a template path is specified
	NSPEC-4374	Filter wheel software installation does NOT timeout
	NSPEC-4403	Inability to open ex log from the Main View window
	NSPEC-4404	Add Error Handling for Empty Job Name Requested Over SECS/GEM
	NSPEC-4416	nSpec does NOT check if an autoloader calibration exists before overwriting it.
	NSPEC-4418	ACS program options wrong user access level
	NSPEC-4429	Continuous scan gets stuck in case of lost frame.
	NSPEC-4431	GenIV AI analyzer disconnects before analysis finishes
	NSPEC-4432	Z axis failure during autofocus when Video Sweep enabled
	NSPEC-4441	Device Inspection Scans on Continuous Scan with Only One Row/Column Fail after Alignment and Focus
	NSPEC-4447	Manual Focus slider in the Imaging Settings window is difficult to use due to slider box boundaries

	NSPEC-4449	Can't save job with Current image setting group
	NSPEC-4456	Export Device Inspection to CSV works on all types of scans and analyses
	NSPEC-4469	Autoloader Map Sensor Error Handling Error
	NSPEC-4473	nSpec Exception log does not print GenTL errors when initializing camera
	NSPEC-4485	Device inspection analysis hangs for very large devices when run with the GPU
	NSPEC-4496	Sensor Map feature no longer functions.
	NSPEC-4501	Incorrect scan properties for Wafer scans done with an overlap
	NSPEC-4505	Alignment file selection is cleared when job fails to save using 'Save Job As...'
	NSPEC-4507	Scan dialog doesn't warn if job not saved after changing Alignment
	NSPEC-4509	nScan crashes if Aligned wafer scan pattern exceeds stage limit
	NSPEC-4533	Vacuum sensors not read when end effector rotated toward stage in autoloader calibration
	NSPEC-4535	Add nSpec version to Analysis Parameters
	NSPEC-4544	16LED slider has all LEDs turned on when capturing the first image
	NSPEC-4547	Image number in wafer scan progress dialog starts at 0 instead of 1
	NSPEC-4548	Alignment still proceeds after alignment file has been cleared for wafer scans
	NSPEC-4551	Gen IV Masking is inconsistent with large devices
	NSPEC-4570	Inability to open Audit log from the Main View window
	NSPEC-4582	Fix running alignments before scans
	NSPEC-4584	Drifting Pattern in Aligned Wafer Scan
	NSPEC-4593	SECS/GEM scan subfolder parameter is broken

		
	NSPEC-4604	GeniCam API access issues in Live View and Bare Wafer Alignment
	NSPEC-4605	Autofocus Doesn't Compare All Options
	NSPEC-4607	Mutex Camera Buffer Acquisition
	NSPEC-4609	Device Inspection on GPU w/ padding does not do template alignment correctly
	NSPEC-4624	Frame Buffer overflow leads to broken promises (was Device Inspection Scans Creating Incorrectly Tiled Mosaics)
	NSPEC-4626	User can not disable GeniCam Region of Interest program option
	NSPEC-4644	Sparta: Vacuum Leaks Too Much When Aligning 200mm Wafer
	NSPEC-4648	Running Calibrations through Utility does not work
	NSPEC-4663	GenIV Hangs indefinitely on scans that have Corrupted images
	NSPEC-4664	Dropping wafers after startup if warnings are ignored.
	NSPEC-4687	Image tiles shift laterally during Wafer Scans when the Live View window is minimized
	NSPEC-4694	Aligner Spindle/Alignment speeds swapped
	NSPEC-4706	Program Option "Alignment Images Highlighted" Does Not Work as Intended and/or Crashes Software
	NSPEC-4708	Reliability Improvement for WD
	NSPEC-4718	Video sweep disables stage view and live view inputs
	NSPEC-4728	GeniCam FPS needs to update when changed to/from trigger mode
	NSPEC-4737	Proper Acknowledgement Handling of SECS/GEM Cassette Scan Command
	NSPEC-4742	Cropped Images Being Exported as Black and White for a Color Camera
	NSPEC-4748	nView defect count does not match sum of all bins

	NSPEC-4750	Running Cassette Job Locally with "Verify wafer Ocr Ids" Turned On
	NSPEC-4758	Incorrect values on AI export when using wafer prediction
	NSPEC-4799	SP autofocus algorithm not renamed in Program Options
	NSPEC-4800	Autofocus category in autofocus settings disappear when the option is not visible
	NSPEC-4801	Live View causes issues with opening different dialogs
	NSPEC-4802	Gen3 AI analysis finds 0 defects
	NSPEC-4804	AI server path Program Option is not updated
	NSPEC-4805	Default timeout for gen4 server connection is too low and leads to often failures
	NSPEC-4806	Alignment file doesn't get updated for Bare Wafer scans
	NSPEC-4807	gen4 AI analysis finds 0 defects
	NSPEC-4808	Bare Wafer Alignment Wizard doesn't see newly created AF and Image Settings groups
	NSPEC-4809	Error on opening an existing Device Inspection job
	NSPEC-4810	Error when running High Resolution Mosaic analyzer
	NSPEC-4811	Device Inspection analysis does not work
	NSPEC-4812	Live View lags
	NSPEC-4813	CDM Ring analysis does not display results (rings) in nView
	NSPEC-4814	Basic Selection analyzers find 0 defects
	NSPEC-4823	Save Job module reverts changes to previous save point if user Cancels or does not Save
	NSPEC-4828	Clean Objectives option crashes nScan
	NSPEC-4829	Stage Limits Exceeded Pops up for Scan Pattern when user Cancels Job if Alignment file is present

		
	NSPEC-4832	nScan crashes when 'nSpec Layout' file selection is cancelled
	NSPEC-4833	Nothing happens when clicking GDS in Device Layout file type selection
	NSPEC-4834	Editable text boxes do not update live view in Bare Wafer Alignment Wizard
	NSPEC-4838	Invalid turret position selection in ManualLoadWafer job property crashes nScan
	NSPEC-4839	Device boundaries shift if Device Inspection runs on GPU
	NSPEC-4841	'Do AF' doesn't work for Manual Set autofocus
	NSPEC-4842	Live view color is mostly blue with AVT color camera
	NSPEC-4846	LiveView can produce runaway stage movement
	NSPEC-4849	New or Existing Device Inspection Scans fails with Stop n Go
	NSPEC-4850	Device Inspection layout device boundaries are offset
	NSPEC-4852	Switching image settings group to 'Current' in Bare Wafer Alignment wizard causes strange error in Image Settings dialog
	NSPEC-4861	GDS Import Aligns Incorrectly
	NSPEC-4870	LiveView running on GPU may fail with GPU resource error
	NSPEC-4871	Percentage CS scans hang or crash nScan
	NSPEC-4872	"Save Image as" in live view does not save resolution correctly
	NSPEC-4873	Using "Current" Group name in Image Setting Group throws AF Parabolic Focus failure
	NSPEC-4875	nScan freezes when using automatic light intensity
	NSPEC-4876	Precision scanning does not use the intensity template for auto light adjustment
	NSPEC-4879	Auto Light is adjusted at each tile for regular Device Inspection scans

	NSPEC-4882	nSpec crashes at Scan initialization
	NSPEC-4895	Device Inspection analysis results are inconsistent
	NSPEC-4897	Unexpected Error During Bare Wafer Alignment
	NSPEC-4899	Live view DrawQuadrantAverages() has a memory leak
	NSPEC-4900	Device Inspection takes more time to run comparing to previous versions
	NSPEC-4909	All category constraints removed when overwriting an autofocus group
	NSPEC-4913	Device Inspection analysis fails to open template file
	NSPEC-4916	Gen4 AI parameters wrong order when upgrading
	NSPEC-4918	Make default value of live view's frame refresh limit 30
	NSPEC-4920	gen4 AI finds 0 defects when resolution mismatch
	NSPEC-4921	Calibration utility physically uses only 10x objective for FF correction for ALL objectives
	NSPEC-4922	Calibration Wafer crosses detection suboptimal on Bonito 2620B
	NSPEC-4923	Template matching wafer prediction fails if template is larger than mosaic
	NSPEC-4924	No way to reset to default values in Bare Wafer Alignment wizard
	NSPEC-4929	Bare Wafer Alignment angle mismatch
	NSPEC-4931	Device Inspection CS scan crashes when using exported from GDS layout
	NSPEC-4934	Timeout does not work for Autofocus
	NSPEC-4936	Stop & Go Scans freeze in the middle
	NSPEC-4947	X and Y of defects found during Aligned Wafer scan are not written in aligned coordinates
	NSPEC-4948	Crack Analysis V2 Incorrect Crack and Slipline Count

		
	NSPEC-4956	Unreadable error message when running gen4 AI on two GPUs
	NSPEC-4957	Gen4 AI "Divide By Device Boundary" analysis parameter overrules "Defects per image"
	NSPEC-4965	Flat-field Not Working on a AVT Color System
	NSPEC-4976	Debug log can not start logging after pressing "Deactivate all"
	NSPEC-4977	Date in nView increments when the window moves around
	NSPEC-4982	Light controls don't work
	NSPEC-4985	Stage veers to one side when commanding it to move down after nSpec initialization
	NSPEC-4990	OpenCV exception during initial auto-light adjustment when running flat-field correction on GPU
	NSPEC-4992	Wafer Alignment File in Scan throws error: Unsupported scan pattern type
	NSPEC-4993	DI crashes if device layout exceeds stage limits. Scan Pattern exceeded Stage related
	NSPEC-5000	Bonito 2620 Camera Cannot Successfully Run Flat-field Calibration
	NSPEC-5002	OffsetX and OffsetY Are Not Accounted for In Device Inspection
	NSPEC-5003	Precision scanning fails with OpenCV error
	NSPEC-5005	"Using Correction Template:" message appears when no job prop specified
	NSPEC-5006	Device Inspection analysis fails sometimes
	NSPEC-5007	DI Scan with Out-of-Stage-Bounds Layout still proceeds
	NSPEC-5008	Map Sensor error should pop up before Alignment starts
	NSPEC-5012	CFET scan tiles shifted on mosaic
	NSPEC-5017	Stop & Go Wafer Scan on XLM stage displays shifted captured images on Mosaic

	NSPEC-5028	gen4 AI freezes on Transferring Images with resnet50
	NSPEC-5032	nScan crashes on FF initialization on systems with Euresys card
	NSPEC-5038	Shifted rows on the Wafer scan mosaic
	NSPEC-5040	Scan Pattern Exceeds message on every subsequent wafer when running DI on cassette
	NSPEC-5051	Roll back disruptive changes to frame buffer for v21 release
	NSPEC-5069	Device layout exceeds bounds
	NSPEC-5075	Cannot save Defect Review job with an empty Defects file path
	NSPEC-5079	(WD) Comms for Vacuum Logging
	NSPEC-5082	Manual set autofocus does not work for device inspection alignment
	NSPEC-5093	Gen 3 analysis fails
	NSPEC-5096	8in (200mm) wafers align but throw error that alignment failed
	NSPEC-5104	Defect Review scan from Image DB uses 'Max Defect Per Device' value as 'Defects Per Wafer' value
	NSPEC-5106	Precision scanning always fails if 'Auto' is checked in image settings
	NSPEC-5108	OpenCV exception after calibrating objective through 'Calibrate Objectives'
	NSPEC-5109	No timeout for Bare Wafer Alignment
	NSPEC-5121	gen4 AI binning is wrong when 2 defects per image allowed
	NSPEC-5133	Cannot overwrite/update existing CameraConfigs with Update Flat-Field calibration
	NSPEC-5138	Deadlock in GeniCam Causing "Waited too long for camera image error" in nSpec
	NSPEC-5140	Waited too long for camera image error during FF calibration
	NSPEC-5142	Waited too long after camera image error after disabling hardware triggering after wafer scan

		
	NSPEC-5143	nScan freezes when Moving the Stage to scan starting position
	NSPEC-5144	Device Inspection analysis fails with openCV error
	NSPEC-5147	nScan crashes during scan when using Contrast Focus Every Tile (CFET)
	NSPEC-5150	CPU usage is 100% for gen4 analysis
	NSPEC-5151	"Scan pattern exceeds..." dialog when running User-Defined scan
	NSPEC-5153	Out of memory error with large devices in precision scan
	NSPEC-5158	OpenCV error when doing precision scanning on Bonito 1250 camera with 5x objective
	NSPEC-5159	"No Lights with Automatic Adjustment Found" error during calibration
	NSPEC-5160	Software freezes during automatic light adjustment during calibration
	NSPEC-5161	Cropping area too small message when doing $\leq 2.5\times$ FF calibration
	NSPEC-5165	Canceling a scan can result into "Waited too long..." error
	NSPEC-5166	Autofocus fails after several scans
	NSPEC-5172	Frames lost during scanning
	NSPEC-5175	Updating/Adding Objectives creates duplicates
	NSPEC-5178	Precision scanning does not display masked area during intensity adjustment
	NSPEC-5179	Option Hardware Turret Control Error message when adding 1.25x Objective
	NSPEC-5182	Waited too long after nScan initialization on Bonito cameras
	NSPEC-5198	Video Sweep moves in one direction only
	NSPEC-5205	Precision scanning uses mask for Global intensity adjustment before first device



182 issues