COMPLEX PHOTONIC SYSTEMS FOR VOLUME MANUFACTURING

Solutions to overcome challenges in Optical Design, Assembly & Industrialization

Simon Schwinger
February 3, 2020

JABIL OPTICS

OUR VISION

To be the most technologically advanced and trusted manufacturing solutions provider

JABIL

Our Company

50+	$25.3B	200k	100+	52M
Years of Innovation	FY19 Revenue	Employees	Sites	Square Feet Manufacturing

Our Markets

Consumer | Packaging | Energy | Printers | Smart Home & Appliances | Retail | Healthcare | Automotive & Transportation | Enterprise, Cloud & Communications | Industrial & Capital Equipment | Defense & Aerospace

Our Reach

INNOVATE › DESIGN › DEVELOP › MANUFACTURE › DELIVER › SERVICE

Our Approach

Empowered Experts | **Innovation Acceleration** | **Engineering Excellence** | **Manufacturing Agility** | **Supply Chain Orchestration**

Our Difference

Global Operational Excellence	**Workcell Model**	**Sustainability**	**Supply Chain Intelligence & Agility**	
Deep Technical Expertise	**Stable & Tenured Management Team**	**Process Innovation**	**Distributed Manufacturing**	**Integrity, Ingenuity & Innovation**

Optical Design

Active Alignment (AA)

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Optical Design

Active Alignment (AA)

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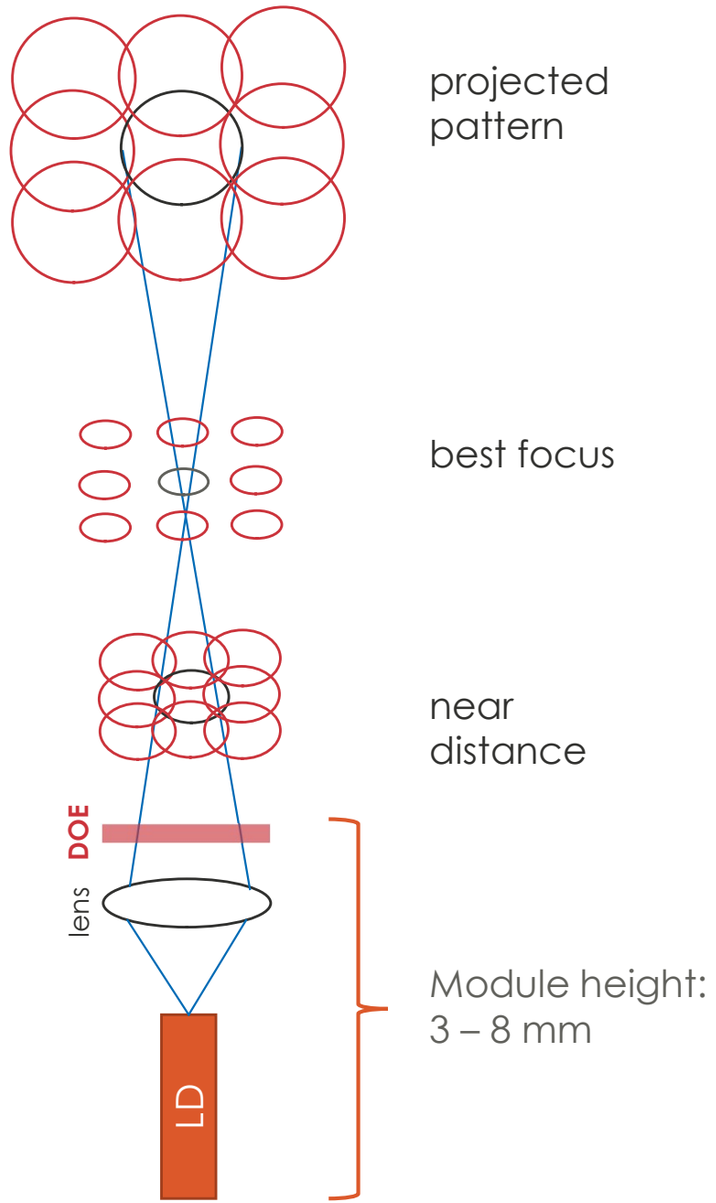
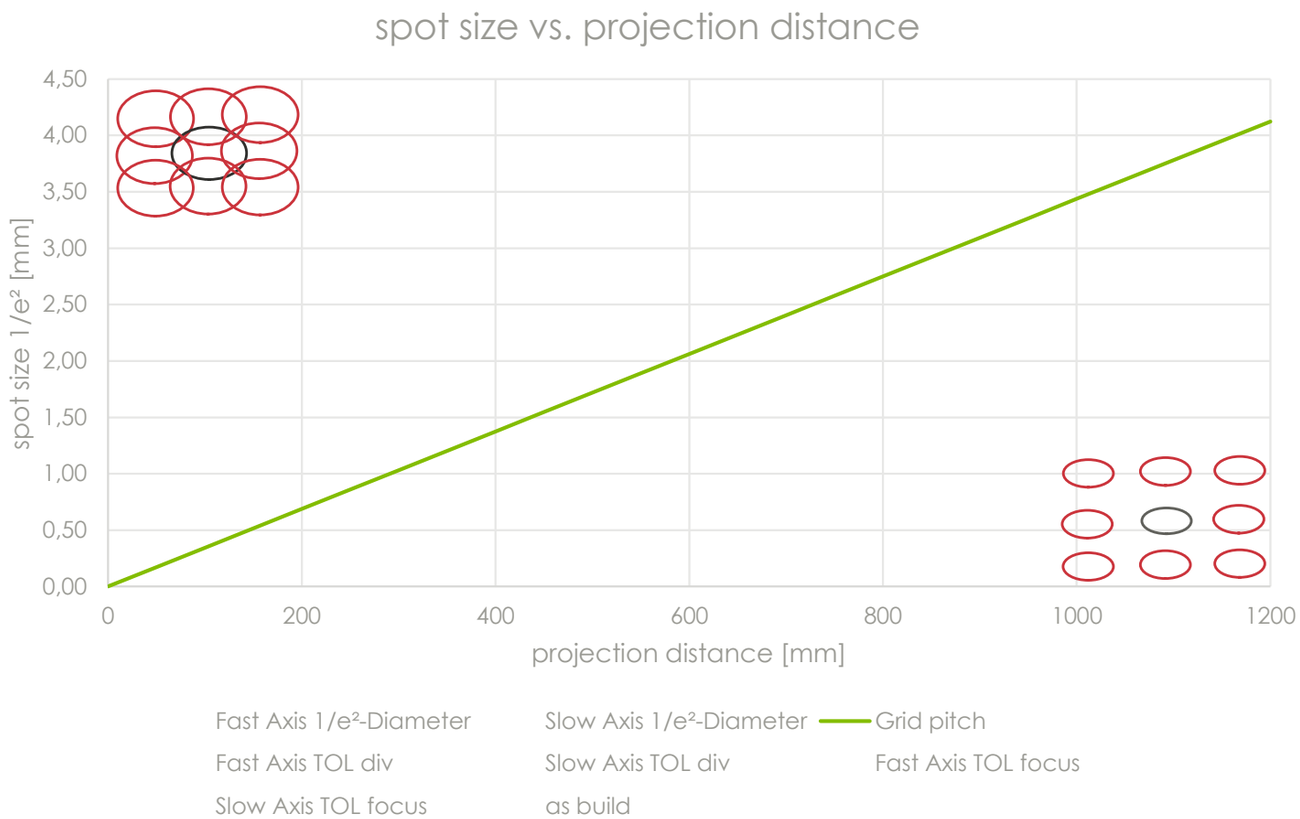
DOT PROJECTOR: CONFIGURATION

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35,5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



DOT PROJECTOR: GRID PITCH

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



DOT PROJECTOR: FOCAL LENGTH

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
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Divergence slow axis	8°±3°
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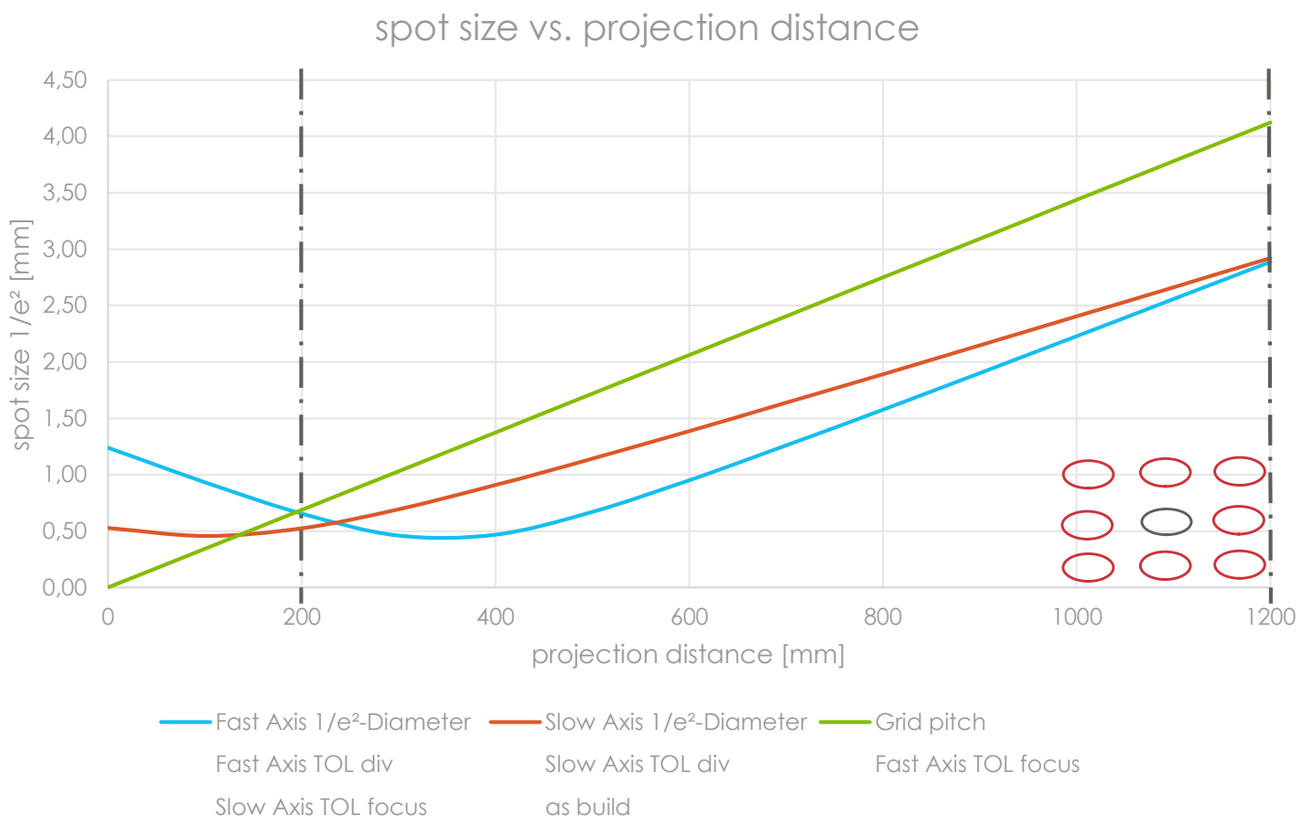
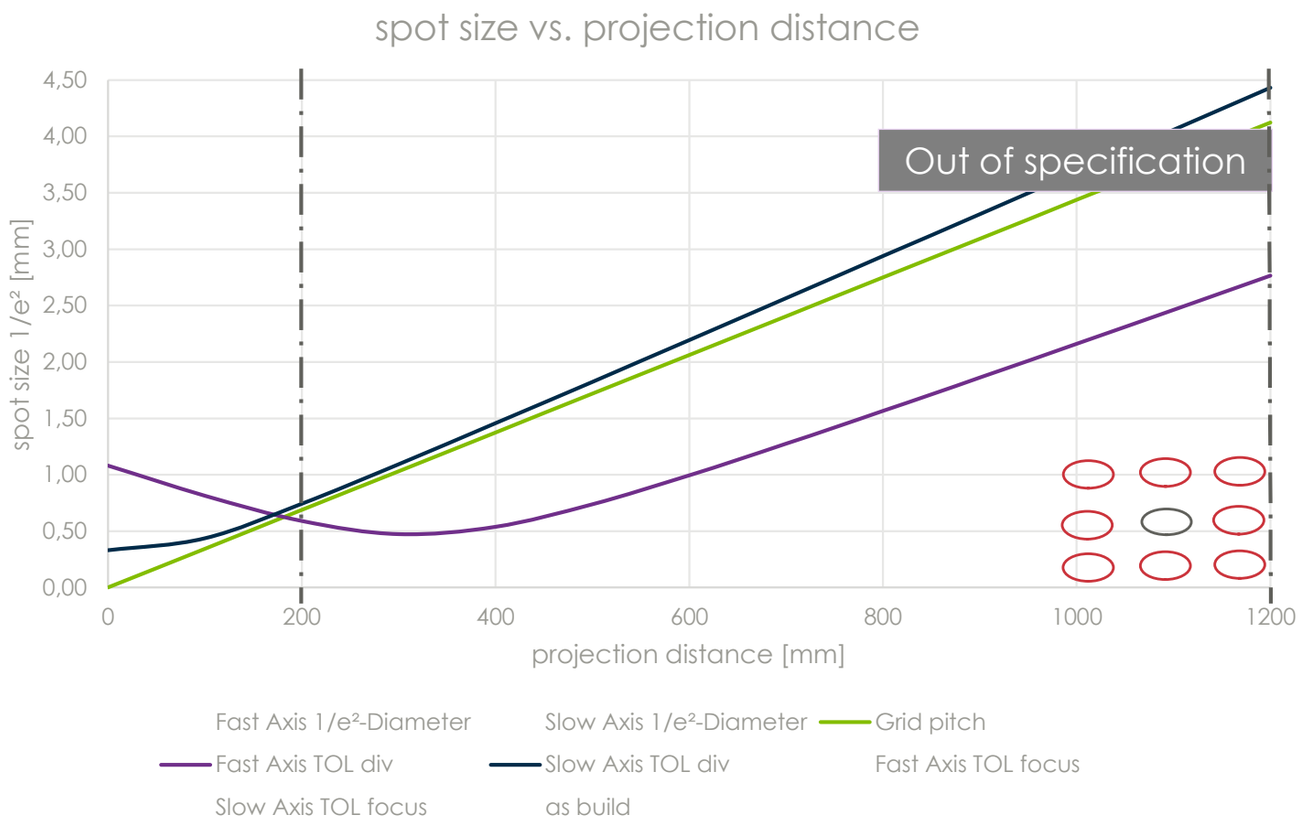


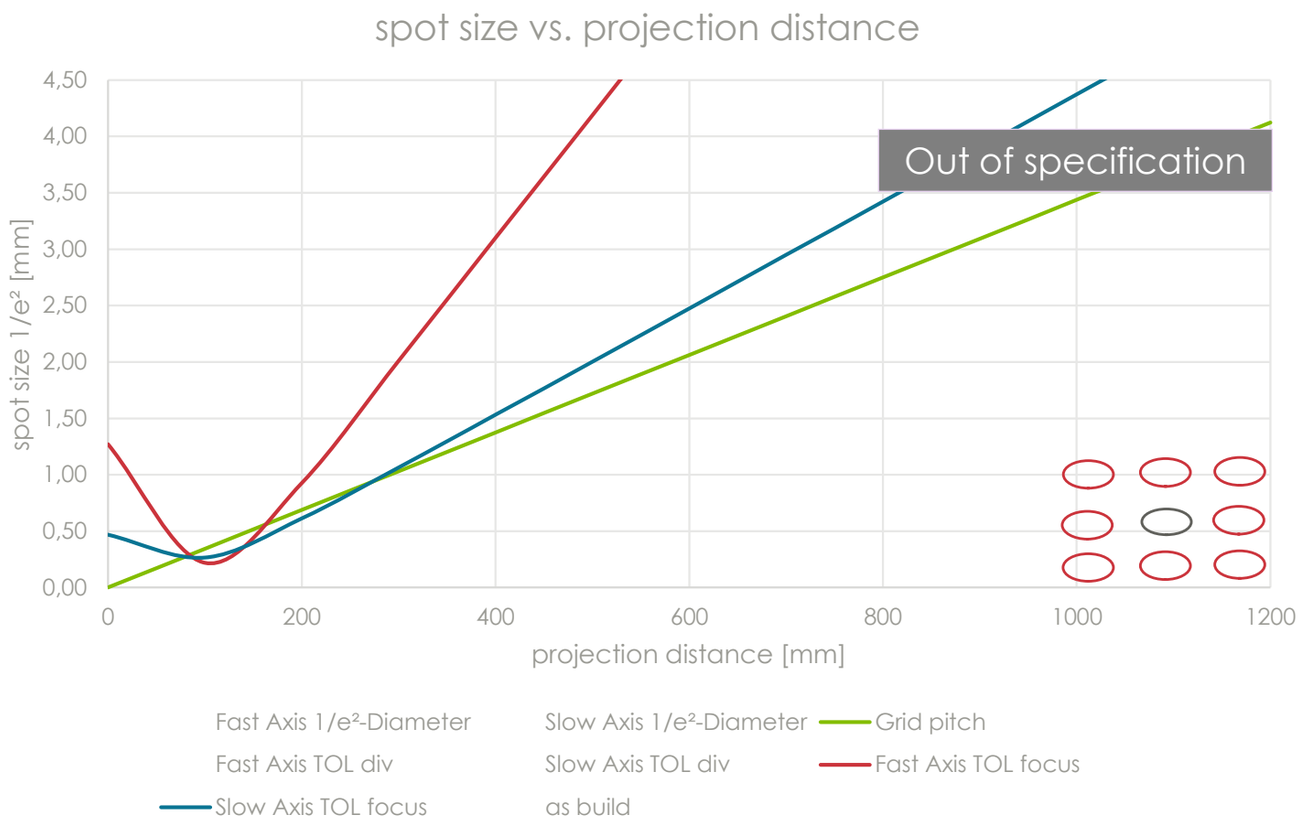
DOT PROJECTOR: TOLERANCE DIVERGENCE

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



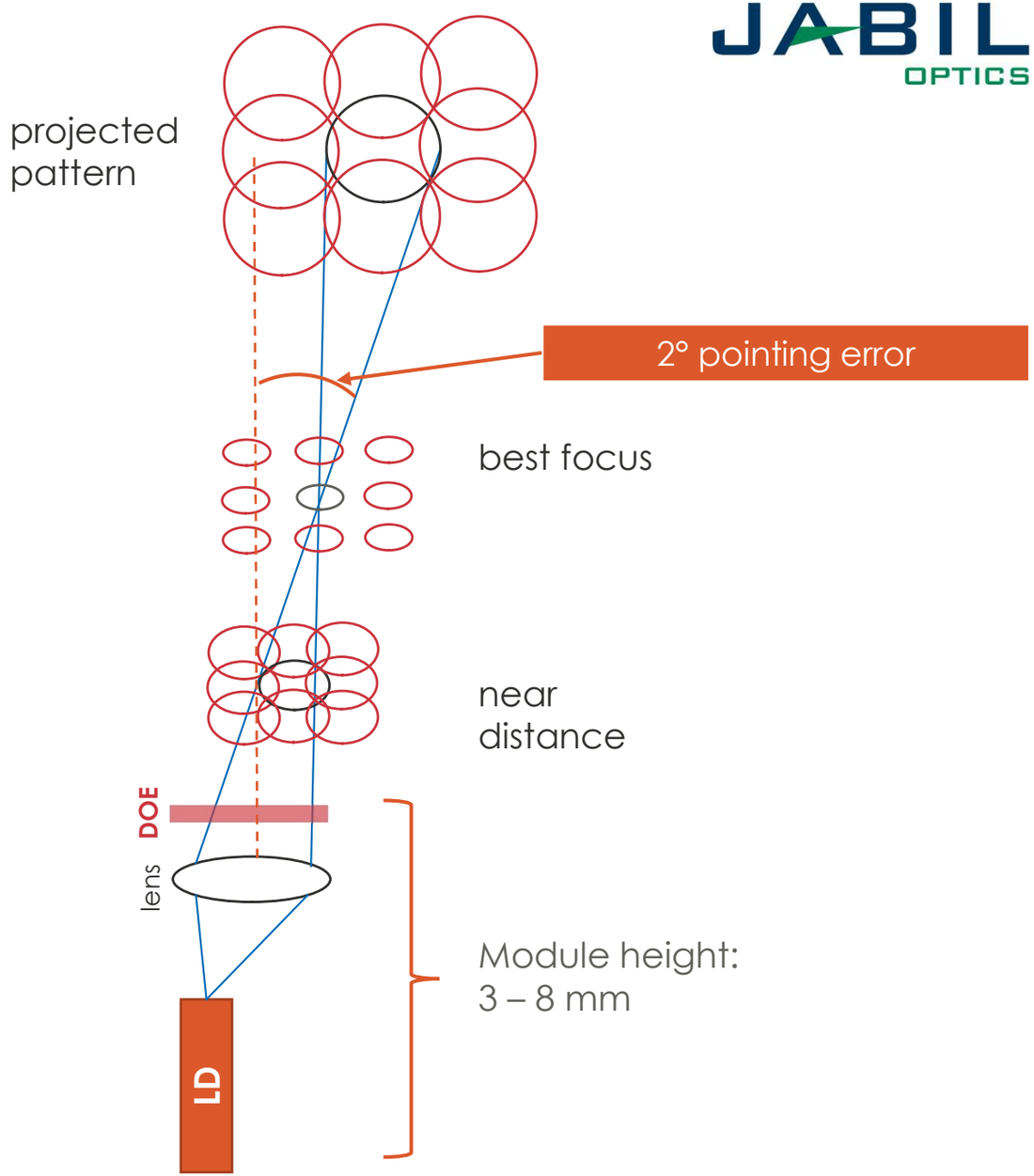
DOT PROJECTOR: TOLERANCE FOCUS WITHOUT ACTIVE ALIGNMENT

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



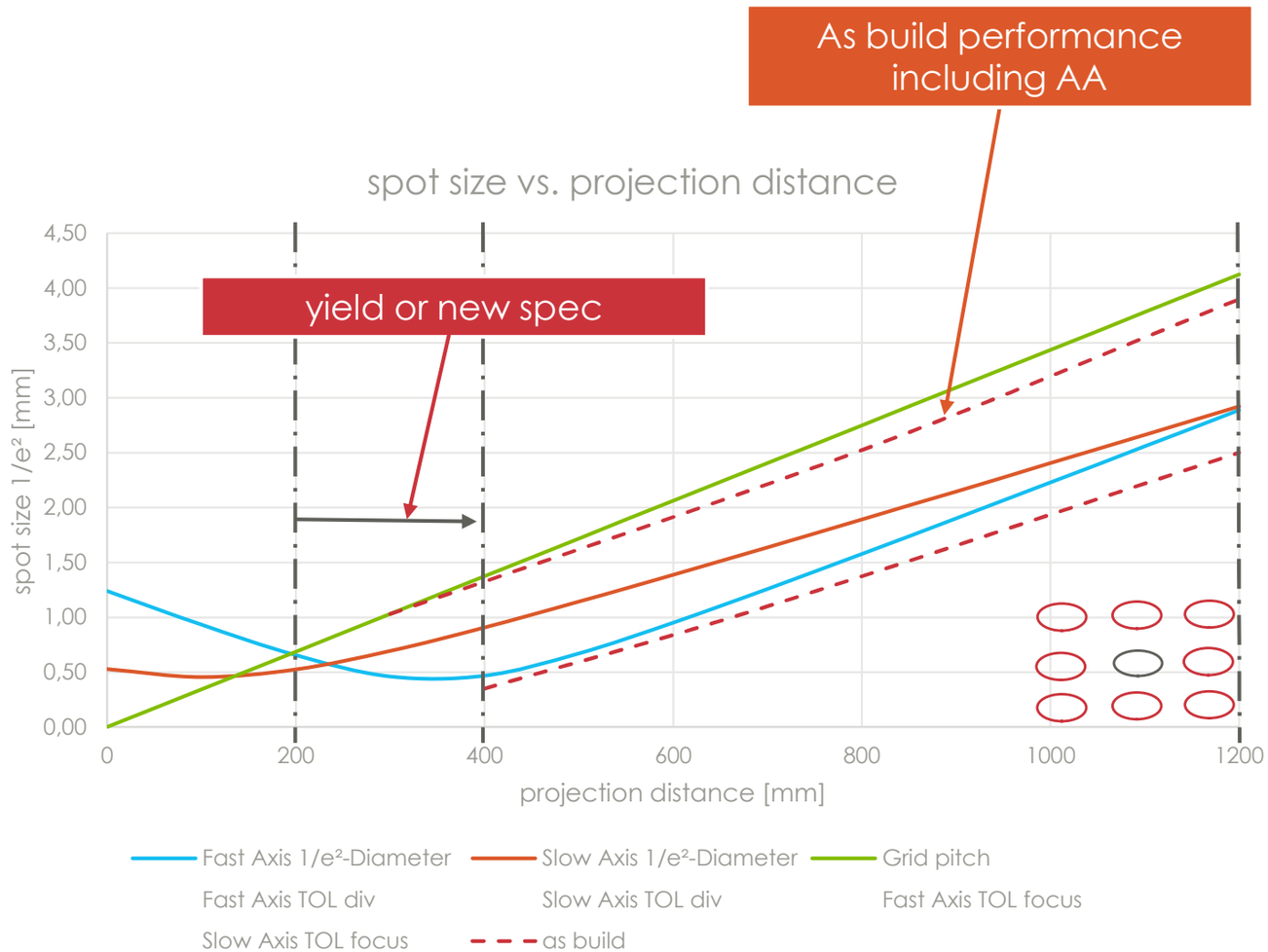
DOT PROJECTOR: SHIFT LD

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



DOT PROJECTOR: AS BUILD PERFORMANCE

Parameter	Value
Wave length	IR 940nm
Focus distance	0.2m – 1.2m
Grid pitch	320 x 180
FoV	63° x 35.5°
LD	TO38:Ø 3.8mm / height ~3.3mm COS: 0.225 x 1 x 0.14 mm³
Focal length	2.2mm
Divergence fast axis	17°±3°
Divergence slow axis	8°±3°
TOL focus without AA	30µm
Shift emitter point	80µm



Optical Design

Active Alignment (AA)

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ACTIVE ALIGNMENT (AA) FOR LIDAR & 3D SENSING USING PIXID PLATFORM

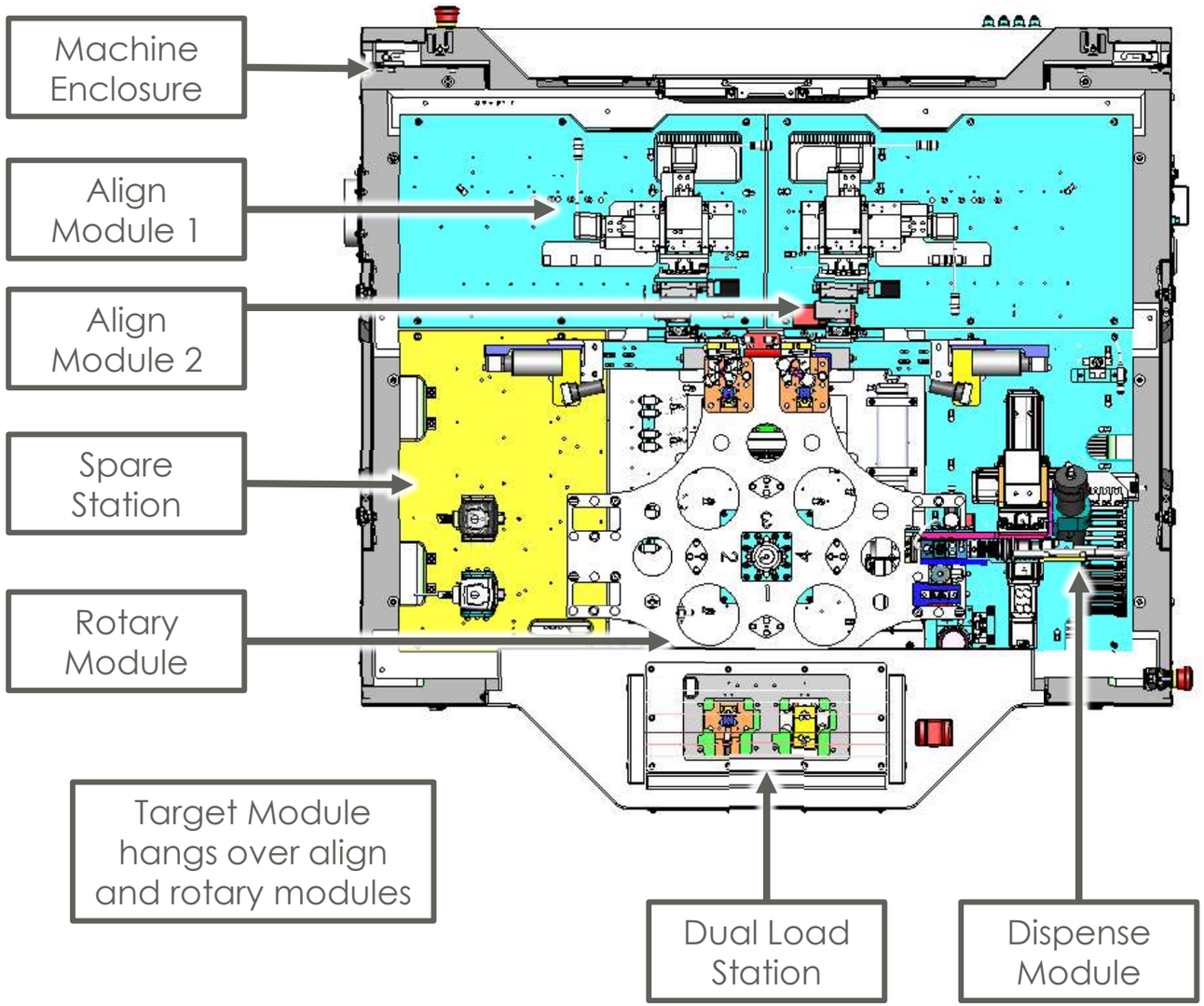
USE CASES

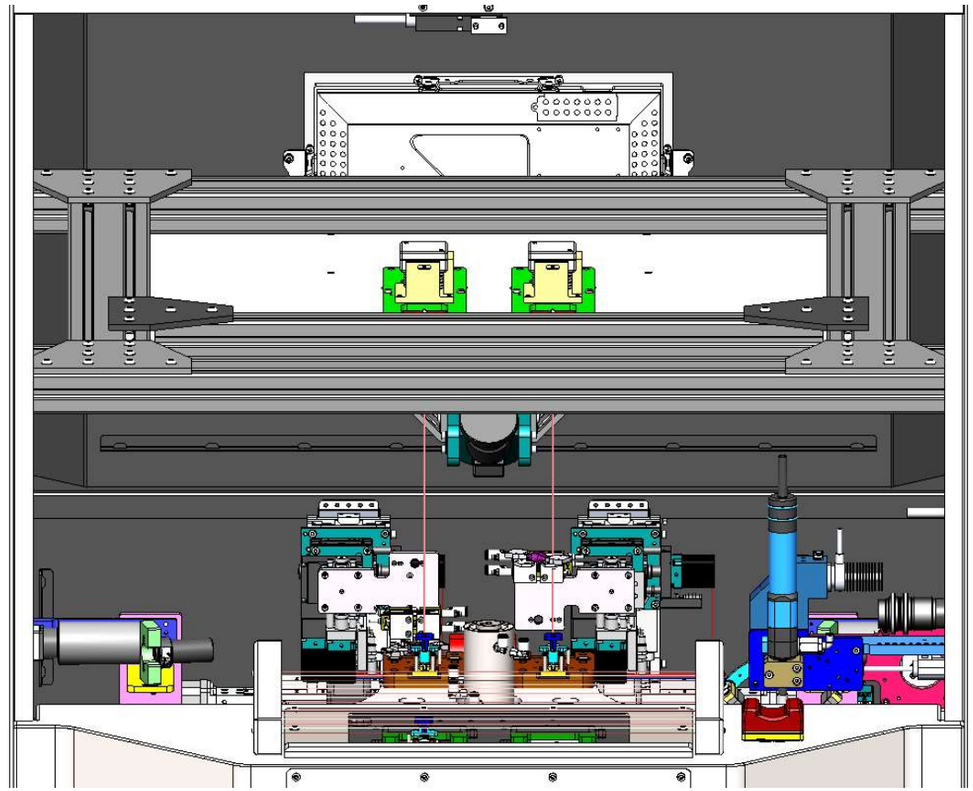
- Lens collimation
- Receiver alignment
- Structured light projection alignment
- Camera lens alignment for structured light inspection
- Module to module relative pointing (tip, tilt, rotation)
- Module to module baseline distance setting (XY)

FEATURES

- Single or dual head - 6 axis Active Alignment
  - 0.2um linear resolution
  - 0.01deg angular resolution
- Automated adhesive dispense with post dispense inspection for quality control
- Customized AA feedback systems and AA algorithms
- Automated UV curing
- Systems delivered with turnkey process for high volume manufacturing

PIXID MACHINE LAYOUT FOR DUAL HEAD LASER PROJECTION MODULE AA

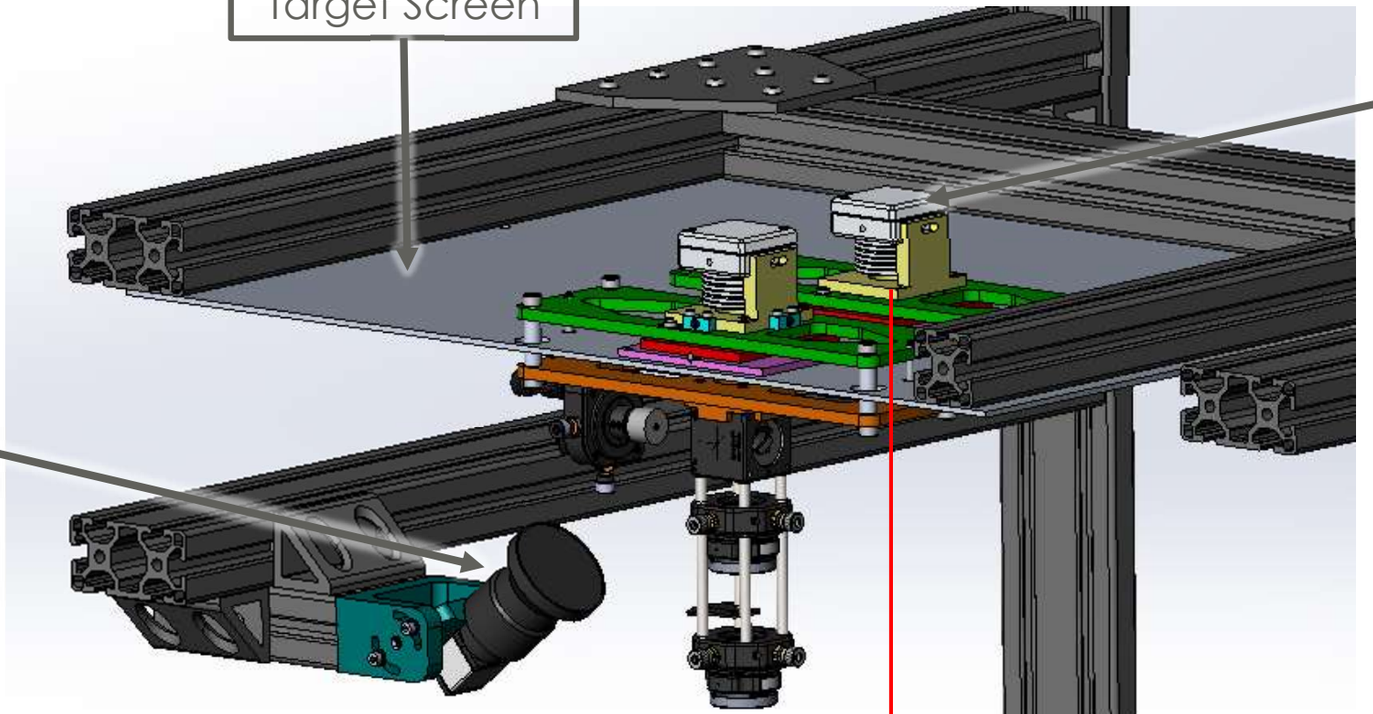




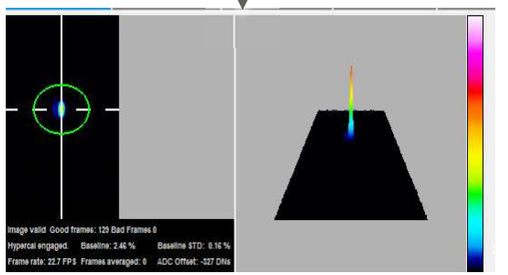
DUAL HEAD LASER PROJECTION MODULE AA FEEDBACK SYSTEM

Camera
(course adjustment, finds spot on target screen)

Target Screen

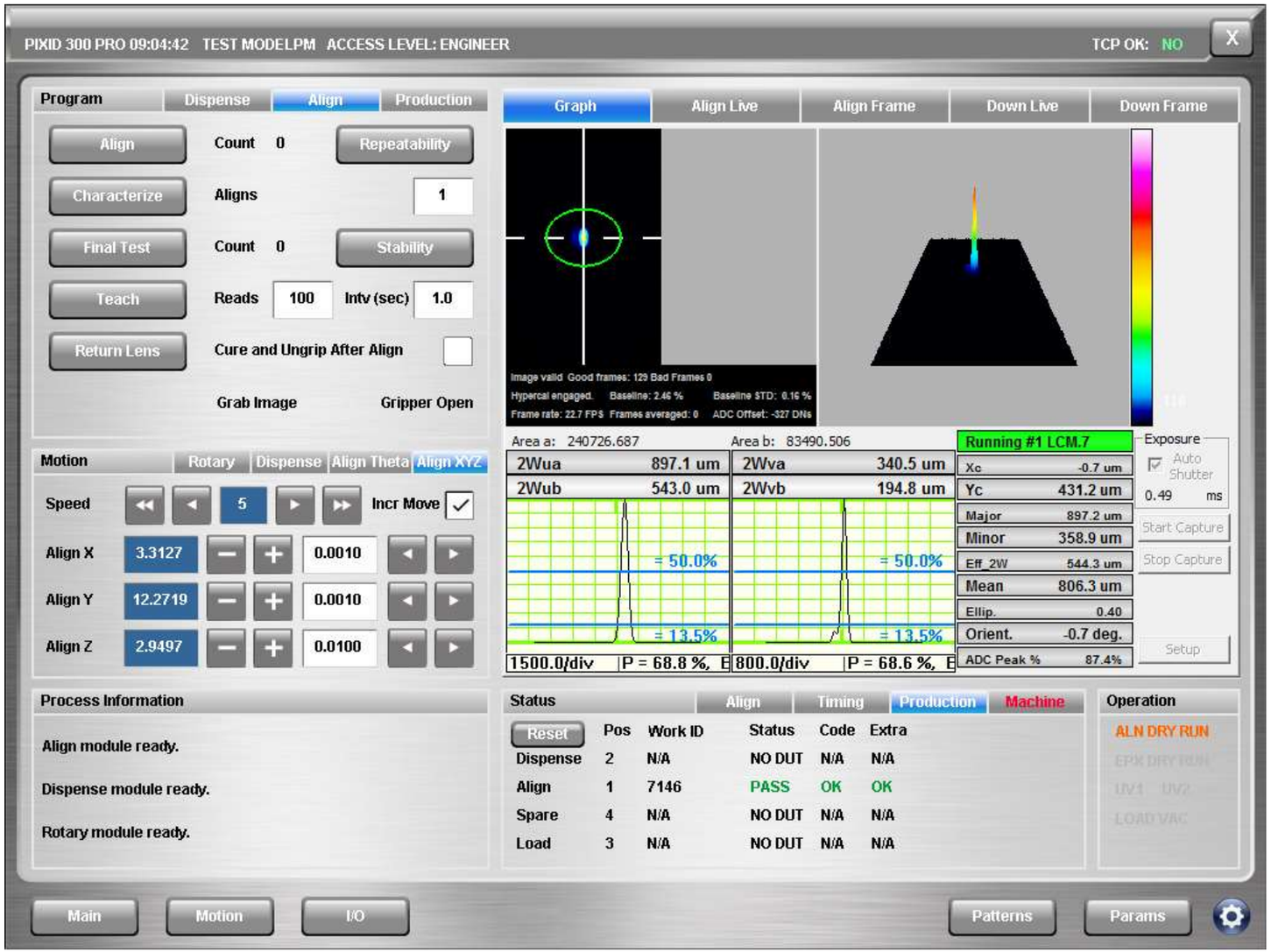


Beam Profiler
(fine adjustment)



Laser Path

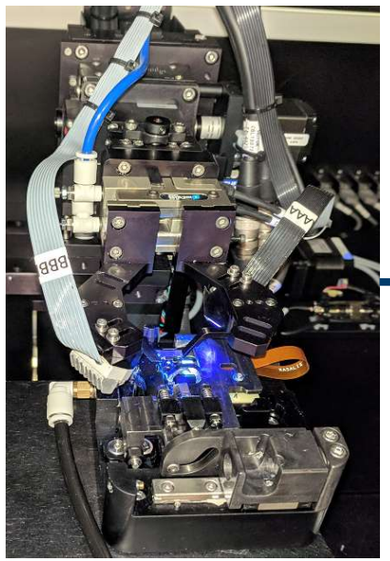
LASER COLLIMATION OPTIMIZATION



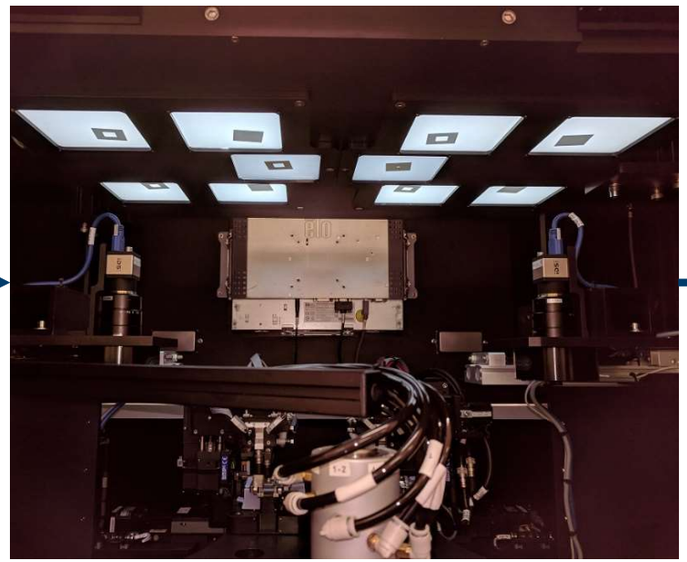
LASER PROJECTION MODULE TESTING

MODULE ASSEMBLY AND INTEGRATION FOR 3D SENSING

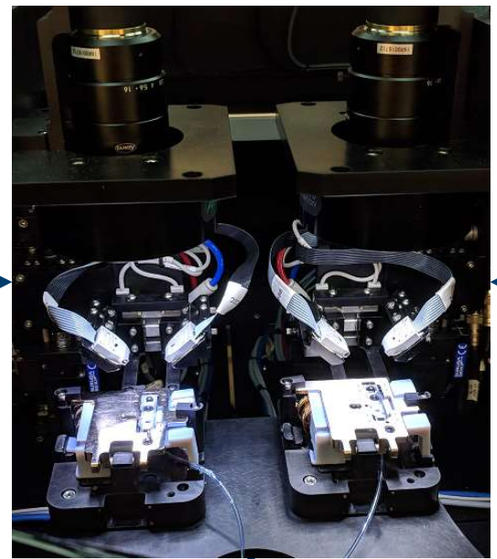
NIR/RGB CCM AA
(focus and pointing)



NIR CCM to RGB CCM Alignment
(pointing and baseline distance)

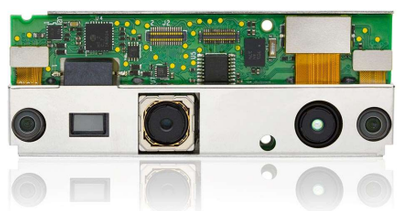


LPM to NIR AA
(pointing and baseline)



LPM AA
(collimation and XY)

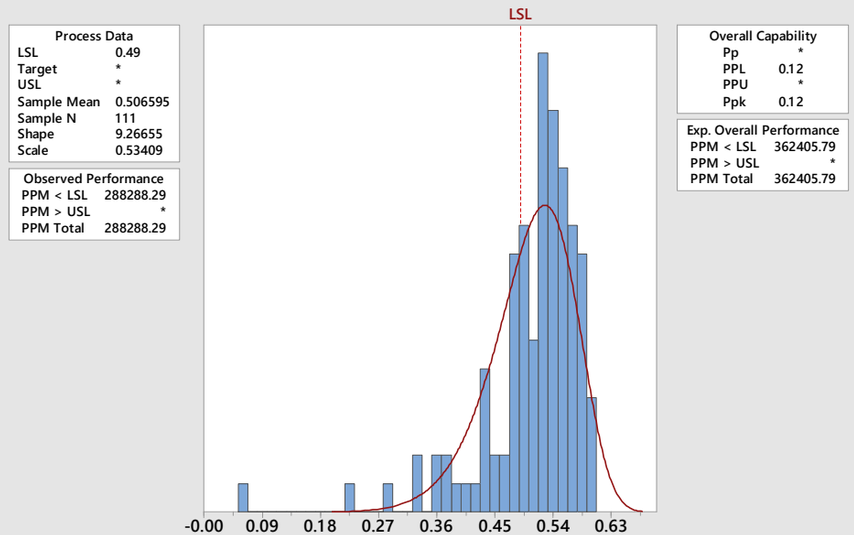
Integrated 3D Sensing Module
(NIR CCM, RGB CCM, LPM)



ACTIVE ALIGNMENT CAPABILITY ANALYSIS

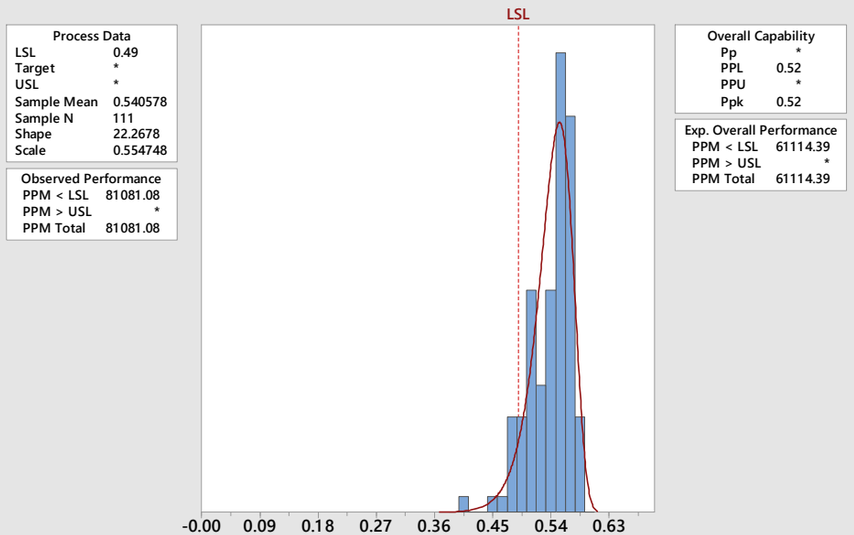
Competitor's screw-in active alignment
36.2% yield loss

Process Capability Report for Lowest Corner - Screw In
Calculations Based on Weibull Distribution Model



Jabil Optics 5 DOF active alignment
6.1% yield loss

Process Capability Report for Lowest Corner - AA
Calculations Based on Weibull Distribution Model



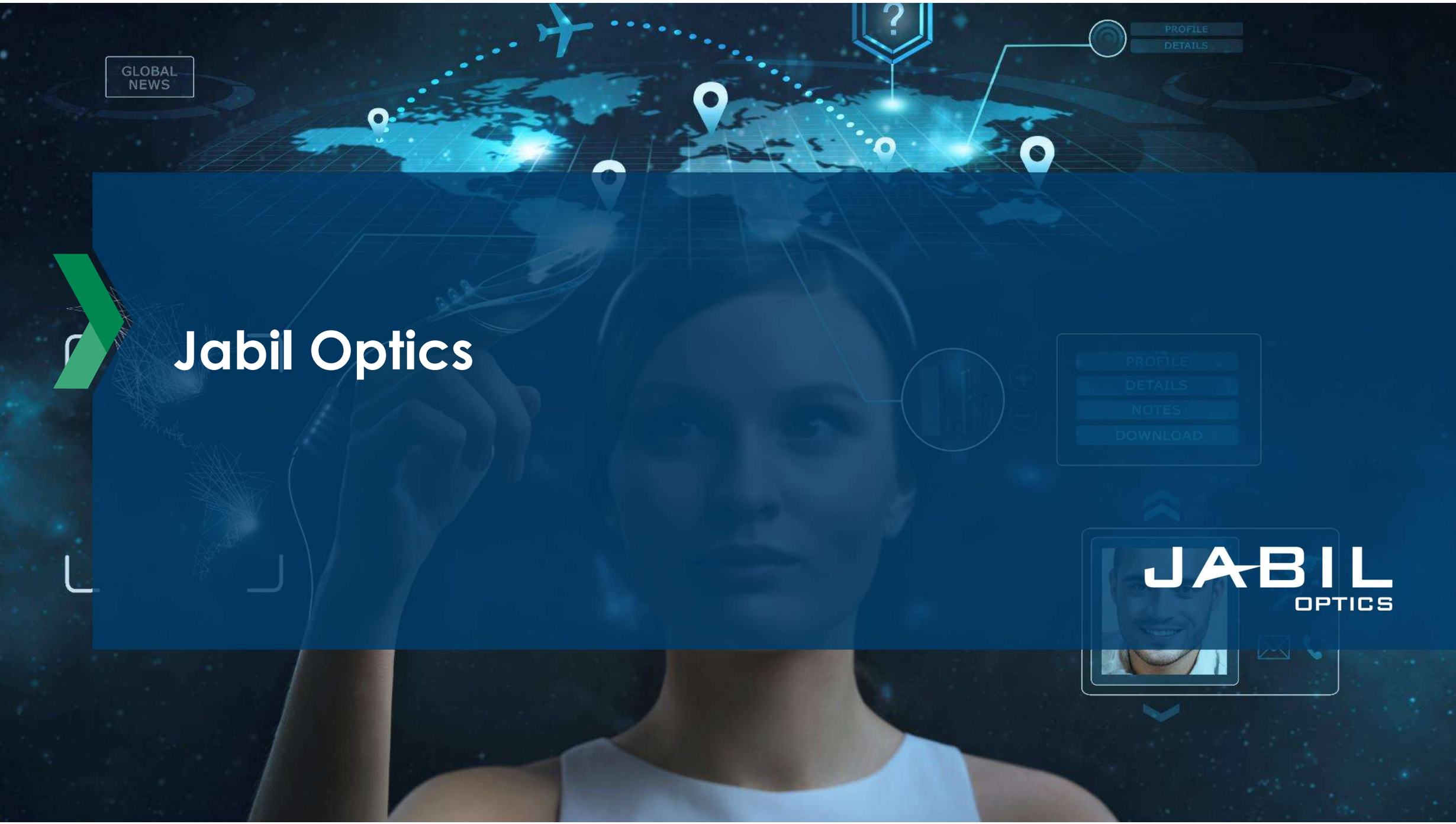
	Screw In	Jabil Optics AA
Ppk	.12	.52
PPM Defects	362,405 PPM	61,114 PPM

YIELD IMPACT CONCLUSIONS

Screw In – 36.2% Yield Loss

Jabil Optics AA – 6.1% Yield Loss

Jabil Optics



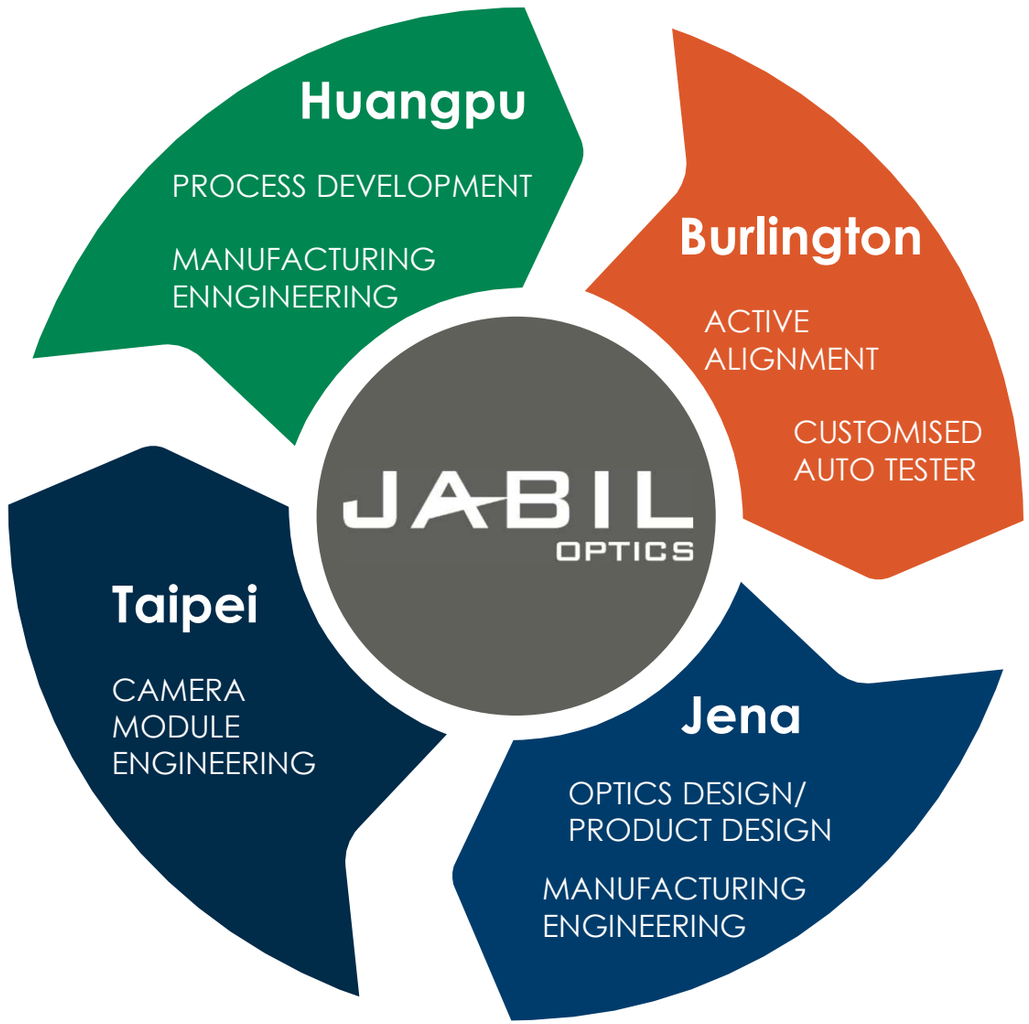
WHAT JABIL OPTICS CAN DO FOR YOU…

PROCESS DEVELOPMENT

- Advanced process solutions
- Optimal material and component selection
- Customized adhesive solutions
- Equipment guidance and selection

MANUFACTURING ENGINEERING

- Design and procurement of optical lens assemblies and sub-assemblies
- New product introduction
- High-volume production of optical solutions
- Final goods assembly
- Test
- Pack-out



ACTIVE ALIGNMENT

- Active alignment
- Precision components placement
- Lens assemblies
- Gluing technologies
- Chip-on-board, Chip-on-flex
- Chip-on-stiffener, FlipChip
- Wire-bonding and ACF bonding
- Assembly automation

PRODUCT DESIGN

- World class optics design
- Electrical engineering
- Design for high-volume manufacturing
- Design to cost

WHAT YOU CAN DO FOR JABIL OPTICS…

Enable
cutting edge technologies

Have
strong brands

Fund
innovative products

Seek a strong
manufacturing partner




JABIL SUCCESS STORIES…

https://www.jabil.com/case-studies.html

https://www.jabil.com/case-studies/case-study-magic-leap.html

https://www.jabil.com/news/innoviz-technologies-announces-after-market-lidar-solution--inno.html

THANK YOU

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OPTICS

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This presentation was presented at EPIC World Photonics Technology Summit 2020

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VIS Vertically Integrated Systems

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PLX INNOVATIVE OPTICAL SYSTEMS

JENOPTIK

MORE LIGHT

LAMPAS

multiple

JePPIX Pilot Line

PIXAPP Photonic Packaging Pilot Line

PASSION

MedPhab

Phabulous

MIRPHAB ENABLING CHEMICAL SENSING

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