

LASER DAMAGE TESTING

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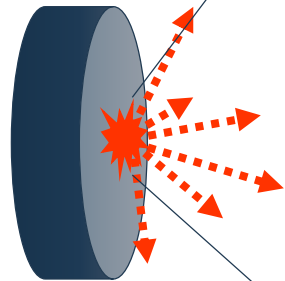


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ISO 9001

High-power lasers suffer from laser damage phenomena



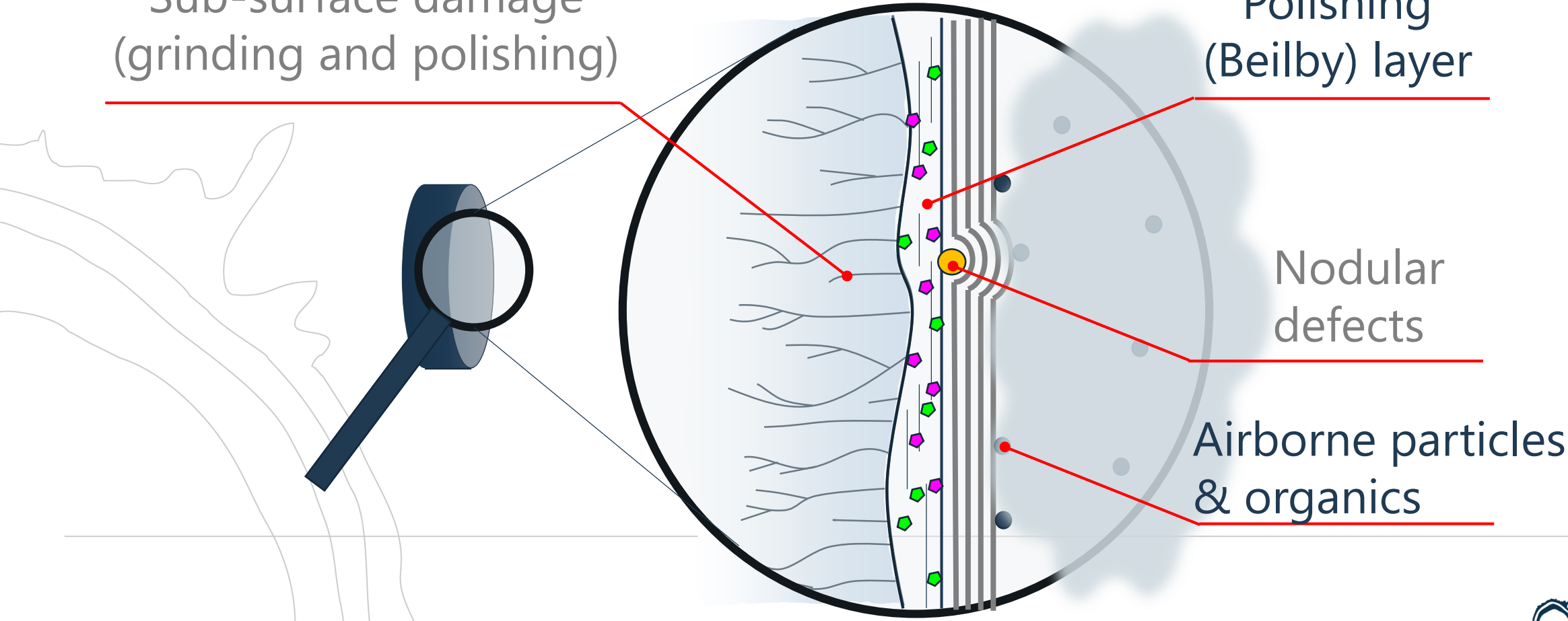
Why optics get damaged?

Sub-surface damage
(grinding and polishing)

Polishing
(Beilby) layer

Nodular
defects

Airborne particles
& organics



Laser damage is a complex issue: many things can trigger it

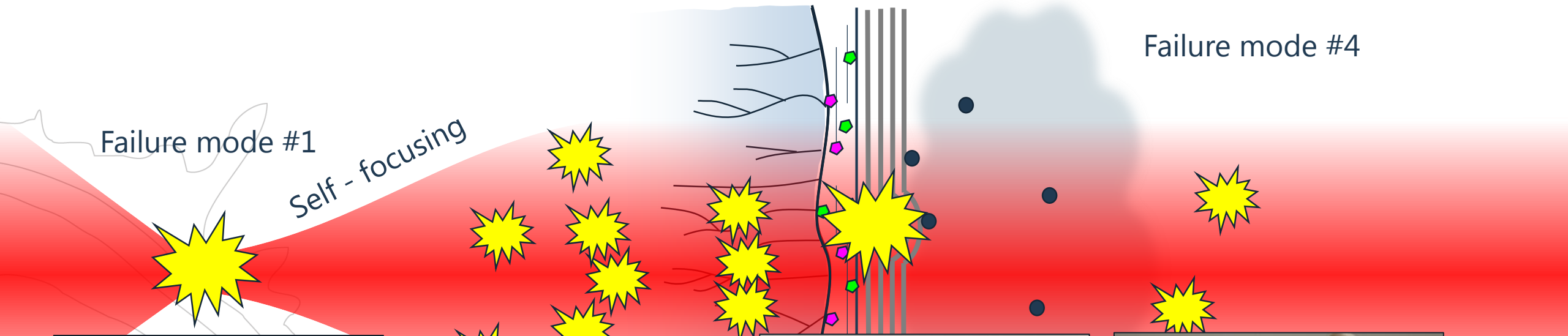
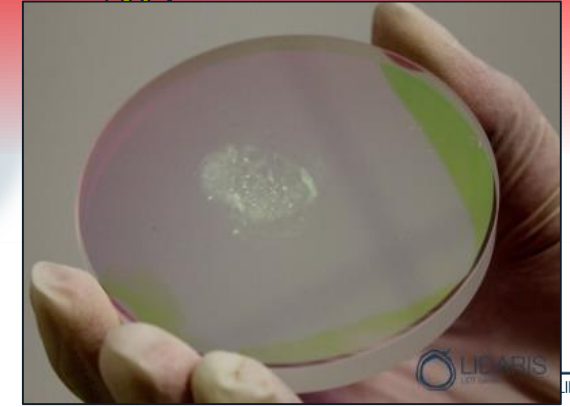
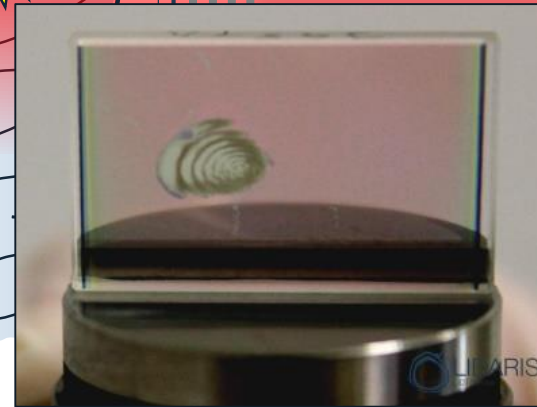
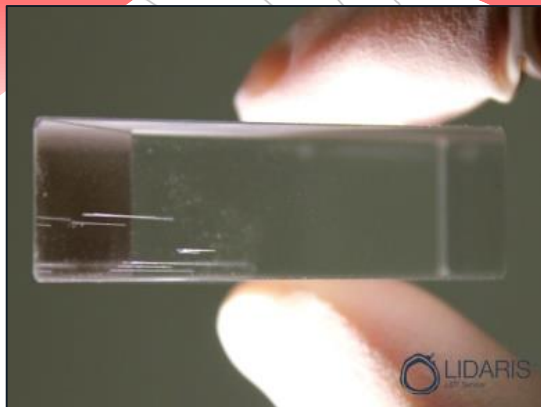
Failure mode #2

Failure mode #3

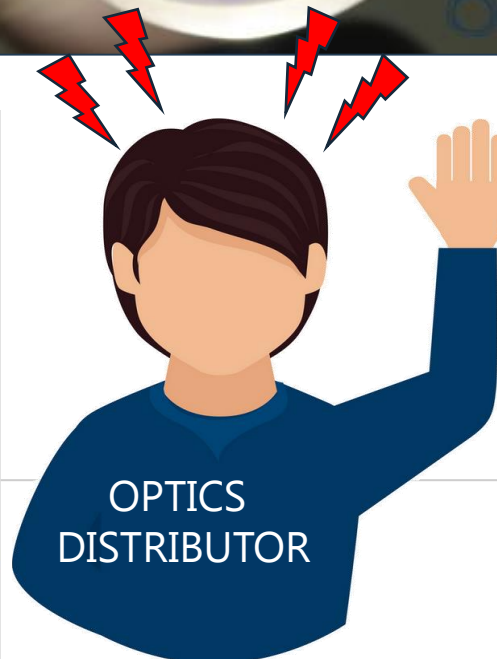
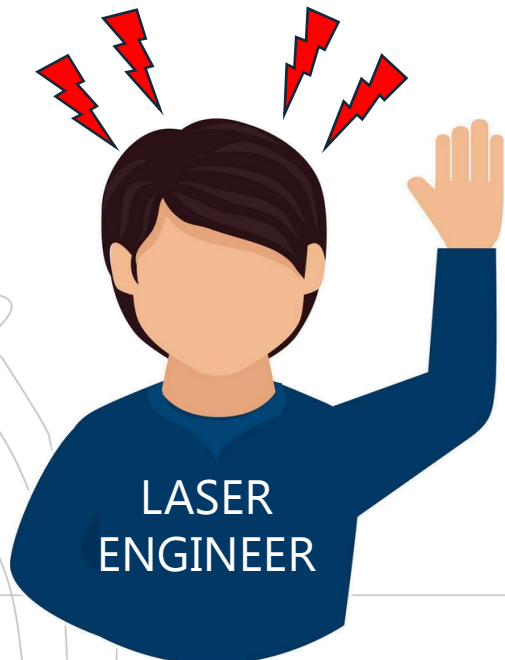
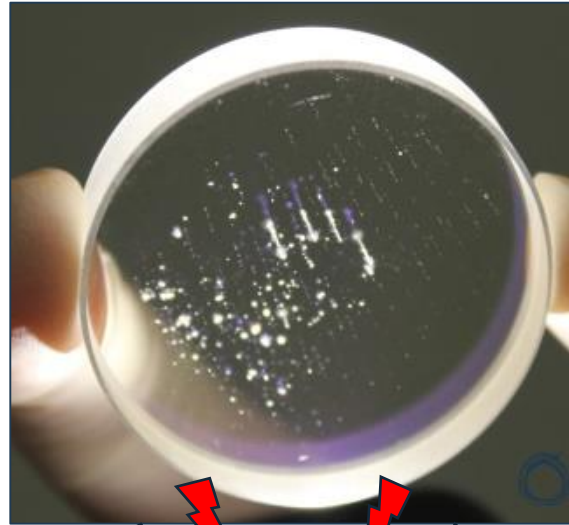
Failure mode #4

Failure mode #1

Self - focusing



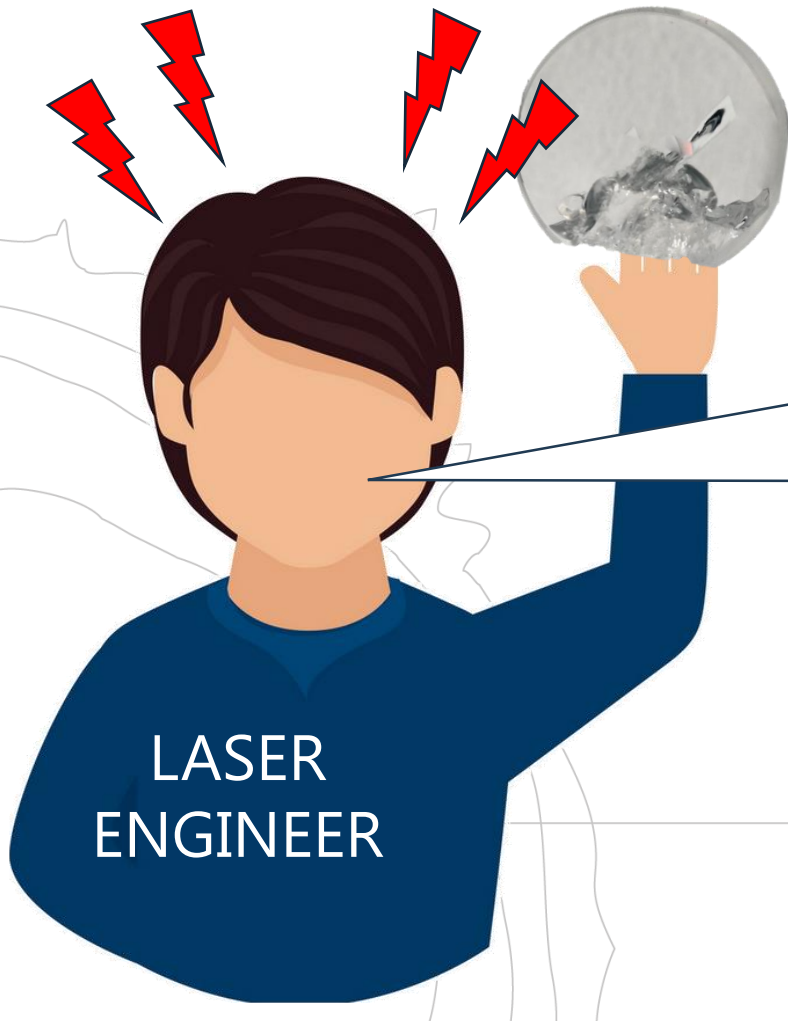
Laser Damage = Problems



Laser Damage = Problems

Laser system failed in the field:

- Idle production time
- Repair cost
- Disputes with clients

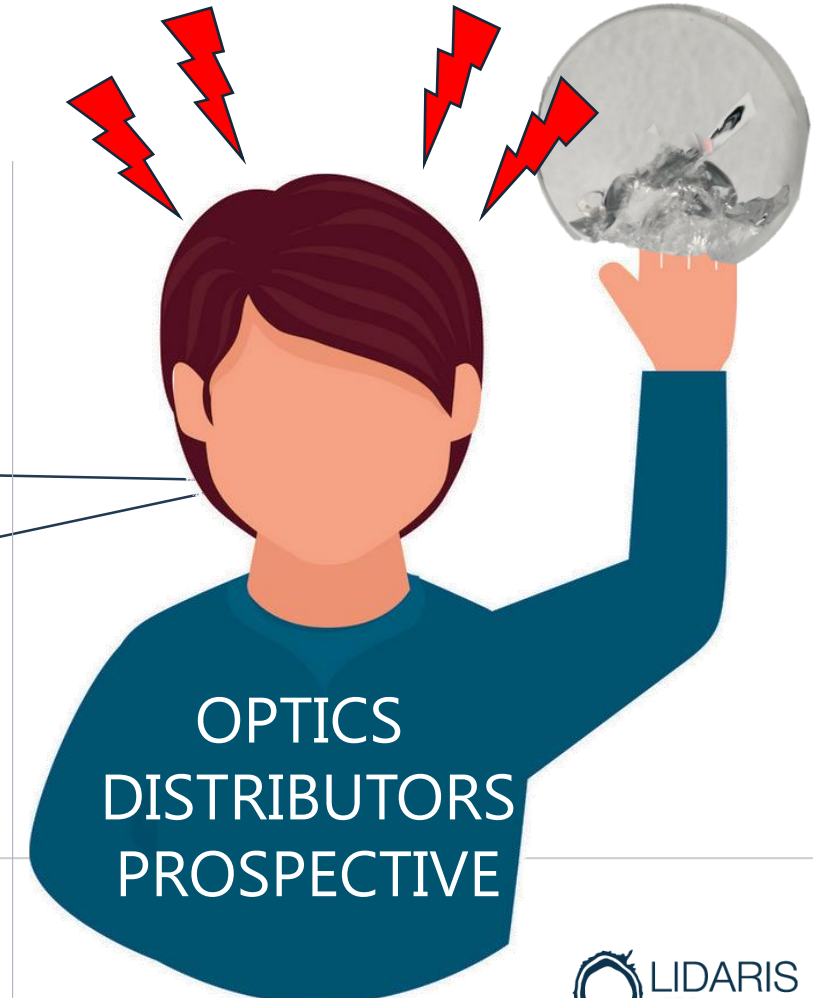


How can I pick best optics for my laser system?
Is there a way to catch bad optics in advance?
Can laser damage be predicted?

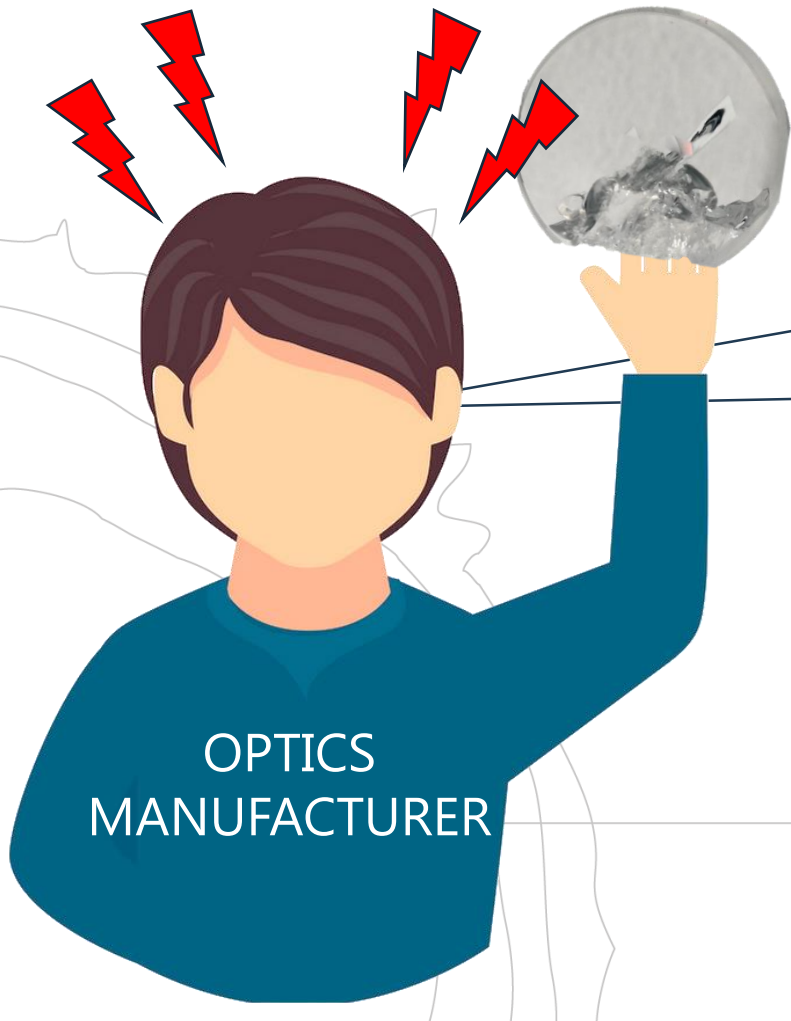
Laser Damage = Problems

- Integrators demand “unbreakable” optics
- Optic is sometimes returned as “damaged”
 - Redo batch or replace optics
 - Lack of understanding how to deal with laser damage

- What went wrong?
- Can I trust my vendor?
- Is quality repeatable from batch to batch?



Laser Damage = Problems

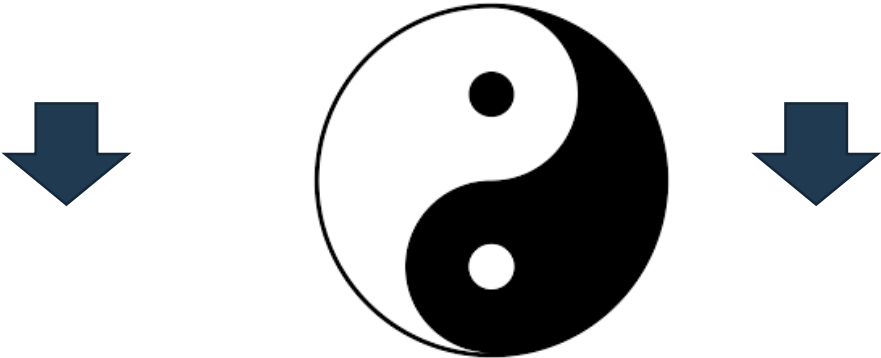


Customers refuse to buy coatings without proven LIDT numbers

I need to improve optics, but there are too many parameters to optimize:
R&D is costly

What can LIDARIS do for EPIC members?

~~Laser Damage = Problems~~



Better Optics Performance = Competitive Edge



What we do?



Break optics to survive high intensity



Perform ISO based testing or certification

- Laser Damage Threshold (LIDT)
- Predict lifetime (ps/fs pulses): best and worst scenario
- Other tests: absorptance + scattering + thermal/wavefront distortion
 - Pick best coatings on the market
 - Compare performance among others
 - Nondestructive pass/fail testing
 - Fast turnaround dedicated service (space-limited: inquiry for availability)



Educate:

- Get familiar with LASER DAMAGE
- Help to choose relevant testing approaches

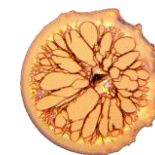
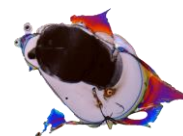
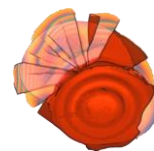
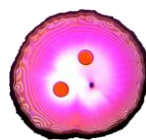
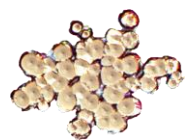
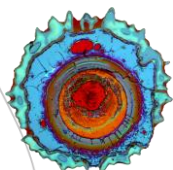


Support Your Optics R&D projects

- Help to understand “what went wrong” and how to improve it (Failure mode analysis)
- Customized functional metrology
- Quantitative feedback

What EPIC members can do for LIDARIS?

- Introduce your products to us
 - we also consume optics and lasers
- Share your challenges with us
 - Book a Zoom meeting (it is free)
 - Come to us, visit us
 - Plan with us about your R&D projects



Why Should I Trust LIDARIS?

We Are

18

People

We Serve

140

Companies

PhDs

5

Experience

> 20

Years in LIDT

On time

90%

R&D projects

> 20

completed

Export

85%

US, EU, ASIA

- Spin-Off of Vilnius University (Laser Research Center)
- R&D projects with industry leaders, including ESA
- Test House of SPIE Laser Damage Competition (2020, 2021 In cooperation with Livermore National Lab)
- Contribute ISO standard development process
- Cover wide range of testing needs (fs-CW / Air-Vacuum)



3x Internationally Awarded:



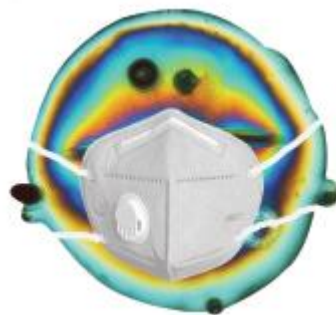
SPIE.



ISO 9001 Certified



THANK YOU FOR YOUR ATTENTION!

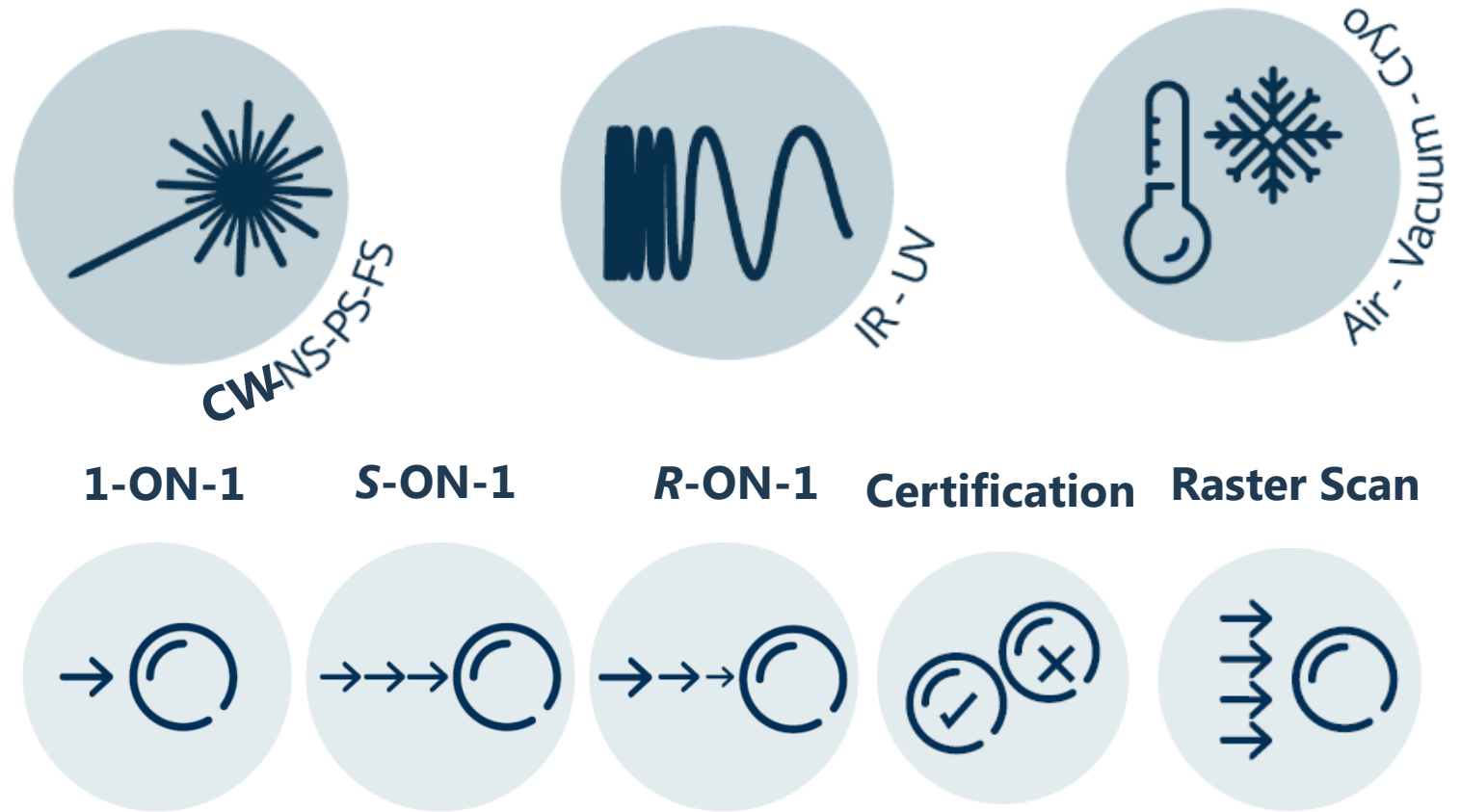


CONTACT US
LET'S MAKE A DIFFERENCE!

sales@lidaris.com

Available LIDT testing conditions

Pulse range	Laser	Effective pulse duration ⁽¹⁾	Wavelength λ , nm	Pulse repetition rate, Hz
CW	CW Ytterbium (Yb) Fiber Laser	Tunable 1 ms – 30 μ s ⁽⁴⁾	1074 \pm 6	Single shot
ns	Nd:YAG (single mode)	10 ns 5 ns 5 ns 4 ns 4 ns	1064 532 355 266 213	1-100
ns	Nd:YAG OPO (single mode)	~4 ns	710-810 1500-2100	1-100 ⁽²⁾
ps-fs	Yb:KGW (Kerr lens mode-lock)	Tunable 180 fs – 12 ps ⁽²⁾	1030 ⁽³⁾ 515 343 258	Tunable 1-200000 ⁽²⁾
fs	Ti:Sapphire ⁽³⁾ (Kerr lens mode-lock)	Tunable 45 fs – 12 ps ⁽²⁾ 45 fs – 1 ps 45 fs – 500 fs	800 400 266	Tunable 10, 100, 1000
fs	Ti:Sapphire OPO (Kerr lens mode-lock)	~ 40-80 fs	250-2500 ⁽⁵⁾	Tunable 10, 100, 1000 ⁽²⁾



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