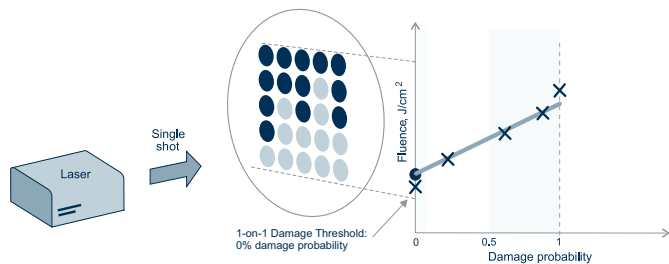


Lidaris provides standard (ISO 21254-1,-2,-3, and -4) and custom Laser-Induced Damage Threshold (LIDT) testing procedures. Additional services such as total integrated scattering test, Group Delay Dispersion (GDD) measurements, crystal efficiency and transmission tests are available on demand.

## ISO 1-on-1 test

The 1-on-1 test is a relatively simple technique for a “non-fatigue” LIDT determination.



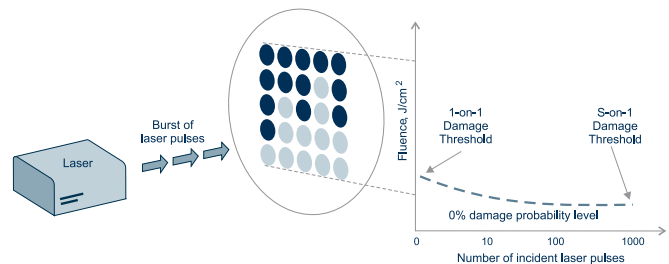
**Principle:** Every site on optics surface is irradiated by a single laser pulse. The LIDT is estimated by fitting damage probability statistics versus applied pulse energy relation using appropriate extrapolation model.

**Use this test for:**

- Optics manufacture (polishing or coating) optimization.
- Investigation of fundamental material properties.
- Identification of distinct defects.
- Quick feedback and relative comparison of the samples.

## ISO S-on-1 test

The S-on-1 test is the most common LIDT test. It is a multipulse procedure, which considers optics aging (fatigue) effects.



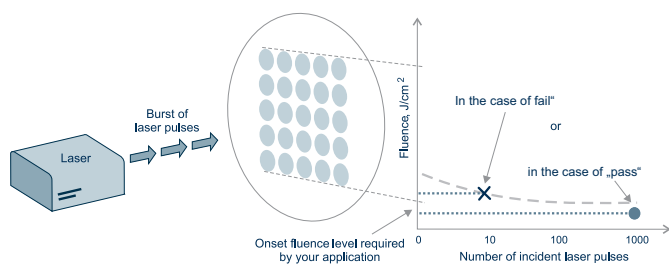
**Principle:** Every site on optics surface is exposed by a fixed (S) amount of repetitive pulses. The LIDT is reported as a function of incident laser pulses.

**Use this test to:**

- Accurately characterize the LIDT of laser optics.
- Learn about the optics aging process.
- Consider effects of repetition rate.
- Extrapolate results to the high exposure dose (available in some cases).

## ISO Pass/Fail (Damage Certification) test

Pass/Fail test is designed to separate good and bad optics at predefined laser fluence.



**Principle:** Multiple laser pulses at a fixed fluence are applied on either one or more test sites. If no damage is observed, optics can be further used after testing. Otherwise, the component does not meet the specifications and cannot be used anyway.

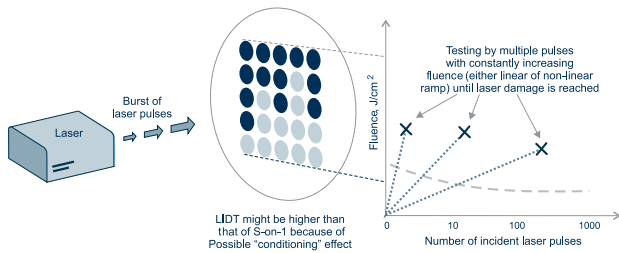
**Use this test to:**

- Monitor optics quality on a daily basis.
- Check purchased optics quality before use in critical applications.
- Inspect whether optical element meets qualifications.

## R-on-1 (ramp) test

The R-on-1 is a non-standard test. It provides rough information about LIDT for surface limited samples (e.g. fibers, small crystals).

**Principle:** The test surface is divided into test sites (considerably fewer test sites, than in S-on-1 case). Each test site is irradiated with a burst of pulses (e. g. 1000) at constant fluence. At each site, the pulse energy is constantly increased (ramped) until the damage is reached.



### Use this test for:

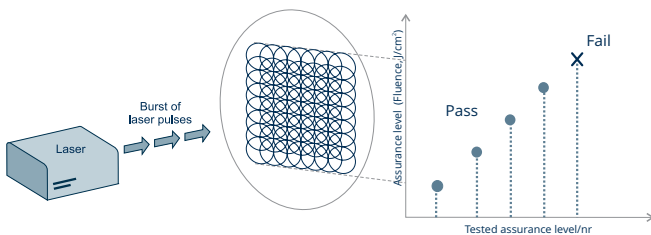
- Test surface limited samples (if S-on-1 test is unavailable).
- Relatively compare production processes or vendors.
- Investigate conditioning (in terms of optical absorption or unknown type of defect reduction).

**Be aware:** Continuous laser interaction with material might cause conditioning effect. Thus, R-on-1 LIDT can be overestimated if compared to S-on-1 results.

## Raster scan test

The raster scan technique helps to detect very rare defects, which could be missed by applying the S-on-1 test.

**Principle:** Fluence handling capability of the sample is investigated by performing a sub-aperture multiple pulse raster scanning procedure. A selected area of the sample is divided into a number of sites with a diameter proportional to the laser beam's diameter. Each site is exposed with a selected number of pulses at the investigated fluence value.



### Use this test for:

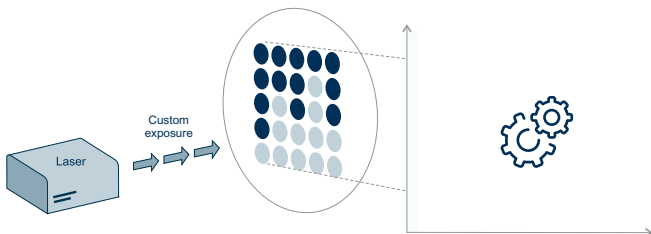
- Characterization of the worst case scenario.
- Optics with small defect densities (e. g. super polished samples).
- Large aperture optics.

**Be aware:** There are different raster scan application methods. Consult the providers before ordering.

## Custom LIDT test

The custom LIDT test is designed to provide the maximum information about LIDT in specific cases.

**Principle:** The needs are discussed with the customer. Standard test methods are adjusted to meet specific requirements.



### Use this test when:

- Custom irradiation conditions: very large number of incident pulses (>1000 per site), also very large or very small (micro-focus) laser test beam diameter;
- Custom exposure algorithm;
- Custom test site layout;
- Custom damage interpretation;
- Custom analysis.

**Be aware:** Custom tests are more expensive and have longer lead times. Not all custom tests can be compared with standard tests.