MIRRORS FOR BIG & SCARY FS, PS LASERS

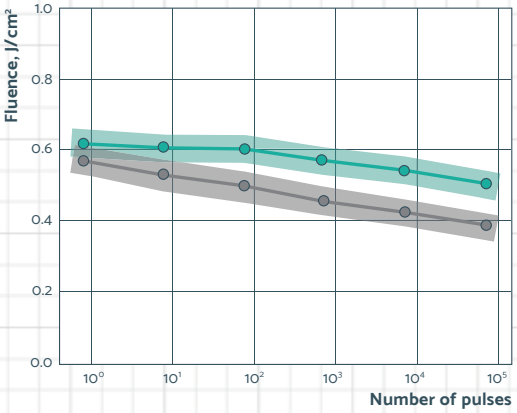
High laser power levels call for high-power measures. OPTOMAN is here to save the day with high reflectivity IBS mirror coatings designed for big & scary ultrafast Yb:YAG, Yb:KYW/KGW, Yb doped fiber lasers.

- Low GDD performance.
- Optimized for high average power ultrafast laser systems.
- Absorption within coating < 1 ppm @ 1064 nm.
- Zero-phase shift behavior.

While high laser-induced damage threshold is a buzzword when talking femtosecond & picosecond optics, it is not (only) the nominal LIDT value that matters. The separation of laser damage modes - catastrophic and color-change - is evident when measuring standard optics. The fatigue effect of color-change damage becomes even more significant for high-power mirrors after prolonged radiation (>10^3 pulses).

Color-change effect is an arch-enemy and a LIDT-limiting factor for ultrafast applications, and has to be eliminated in order to increase the lifetime of optics

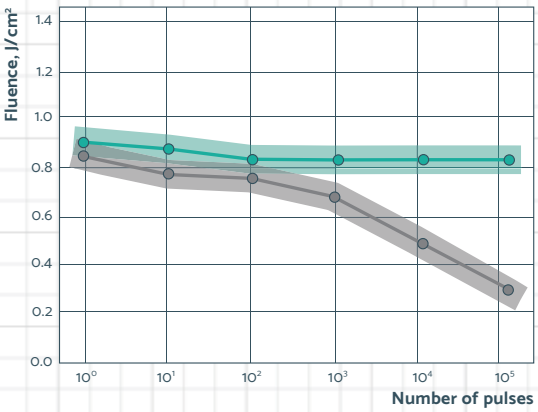
Market-Standard Mirrors



- Catastrophic
- 95% confidence interval
- Color change
- 95% confidence interval

Wavelength: 1030 nm
Pulseduration (FWHM): 491.1 fs
Repetition rate: 10 kHz
AOI: 45°
Polarization: Linear P
Beam diameter (1/e²): (177.4 ± 3.6) µm

Market-Standard High Power Mirrors



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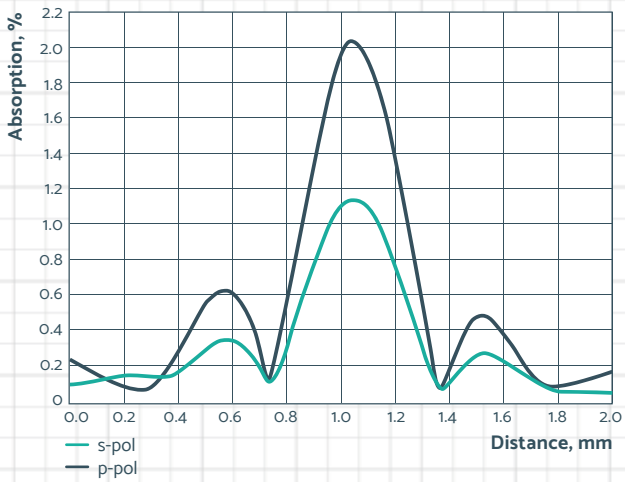
- 95% confidence interval
- Color change
- 95% confidence interval

Wavelength: 1030 nm
Pulseduration (FWHM): 491.1 fs
Repetition rate: 10 kHz
AOI: 45°
Polarization: Linear P
Beam diameter (1/e²): (177.4 ± 3.6) µm

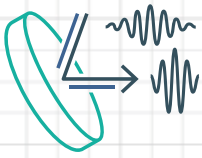
It is well known that absorption is the main cause of laser damage. Strategically working towards color-change elimination, OPTOMAN did a number of R&D runs, aiming to optimize coating design, coating parameters as well as pre- and post- coating processes. Eventually, OPTOMAN was able to reduce coating absorption down to ~1 ppm for the s-polarization component and ~2 ppm for the p-polarization component:

Absorption @ 1064 nm ~1 ppm for s-pol component and ~2 ppm for p-pol component.

Measured by PCI technology.



This achievement has paved the way to develop **a product specifically optimized for ultrafast laser applications – SuperHero League Mirrors featuring no color-change damage**. The LIDT of these mirrors is defined only by the catastrophic-damage values which have also been boosted and are higher than market-standard high-power mirrors.

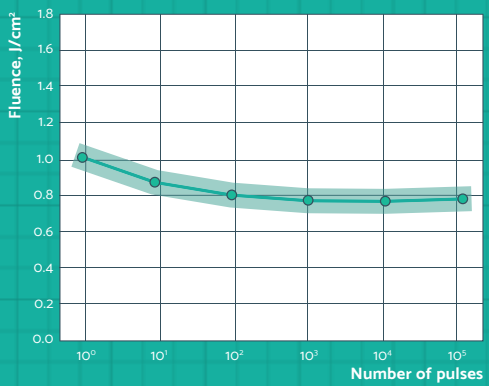


SUPERHERO LEAGUE MIRRORS (ULLM5SHL)

- Very high LIDT
- No color-change damage
- Fully characterized

LIDT	Lifetime	Price
●●●●○	●●●●○	●●●○○

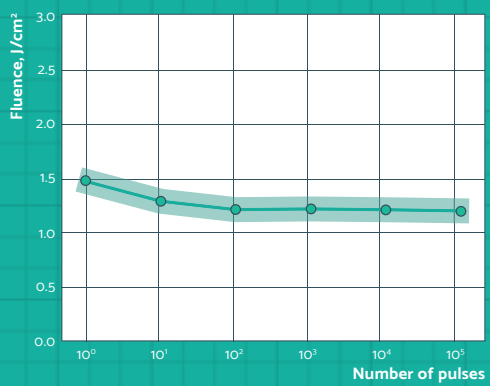
High confidence level >0.7 J/cm²



○ Catastrophic
□ 95% confidence interval

Wavelength: 1030 nm
Pulseduration (FWHM): 497.7 fs
Repetition rate: 10 kHz
AOI: 45°
Polarization: P
Beam diameter (1/e²): (176.8 ± 4.8) µm

High confidence level >1 J/cm²

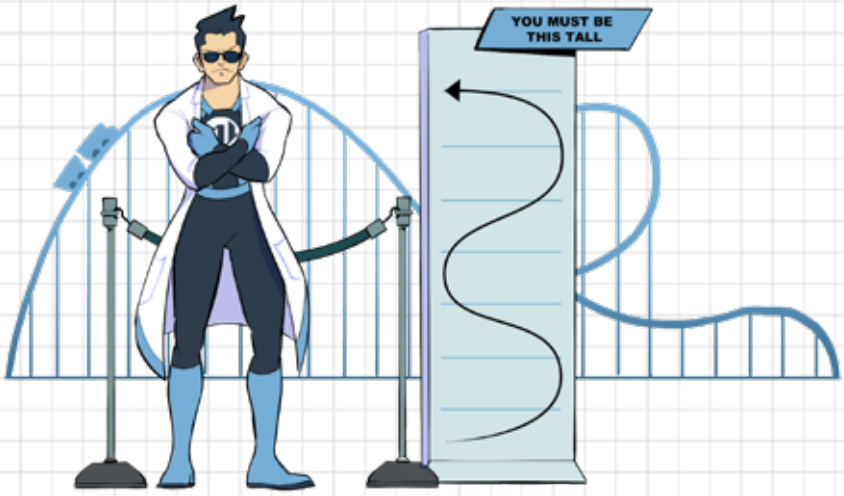


○ Catastrophic
□ 95% confidence interval

Wavelength: 1030 nm
Pulseduration (FWHM): 491.1 fs
Repetition rate: 10 kHz
AOI: 45°
Polarization: Linear S
Beam diameter (1/e²): (177.4 ± 3.6) µm

SuperHero League Mirrors are the upgraded version of OPTOMAN bestseller – ULLM5 mirrors.

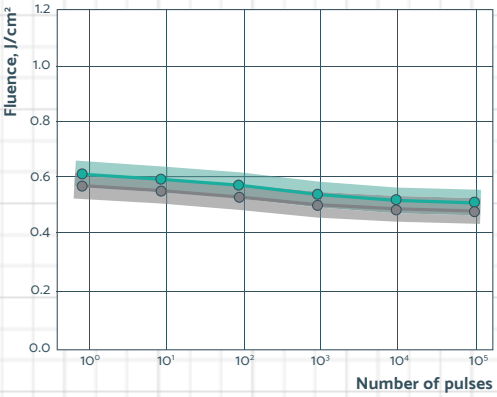
STANDARD MIRRORS (ULLM5)



- Perfect price-to-performance ratio
- Industry standard specifications
- Fully characterized

LIDT	Lifetime	Price
●●●○○	●●●○○	●○○○○

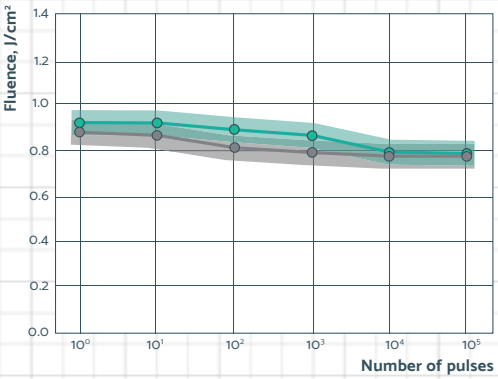
High confidence level >0.4 J/cm²



- Catastrophic
- 95% confidence interval
- Color change
- 95% confidence interval

Wavelength: 1030 nm
Pulseduration (FWHM): 491.1 fs
Repetition rate: 10 kHz
AOI: 45°
Polarization: Linear P
Beam diameter (1/e²): (177.4 ± 3.6) µm

High confidence level >0.7 J/cm²



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- 95% confidence interval
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Wavelength: 1030 nm
Pulseduration (FWHM): 491.1 fs
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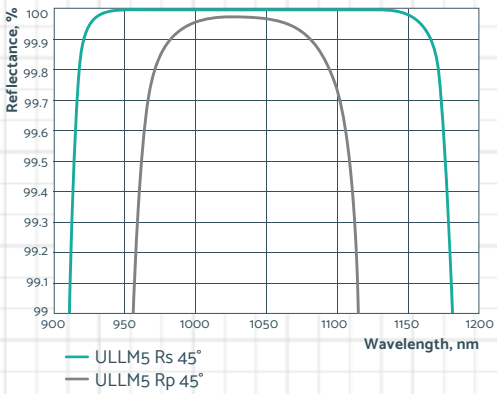
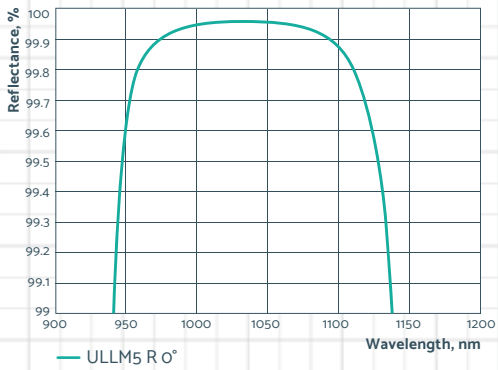
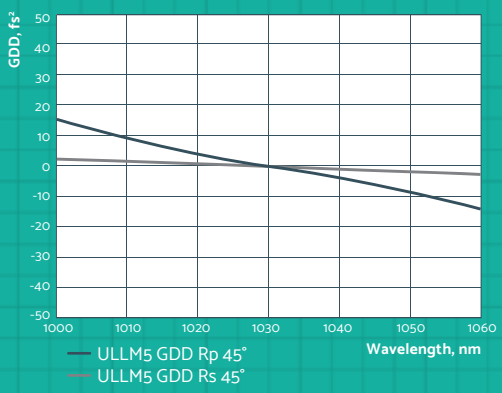
Rs > 99.95% & Rp > 99.9% @ 1010-1050 nm

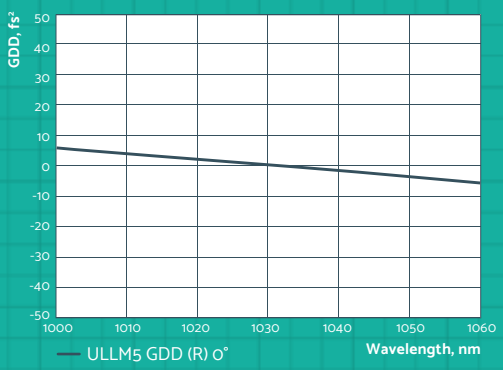




Reflected Group Delay Dispersion

IGDD Rsl<20 fs², IGDD Rpl<50 fs²





	Standard (ULLM5)	SuperHero League (ULLM5SHL)
Substrate	UVFS	
Surface Quality, S1	10-5 S-D (MIL-PRF-13830B)	
Surface Flatness, S1	<λ/10 @ 633 nm over CA	
AOI	0° or 45° or which ever °	
Coating (IBS)	HRs>99.95% & HRp>99.9% @ 1010 – 1050 nm (Yes, custom bandwidths available)	
Laser Induced Damage Treshold	**Femtosecond:** > 0.4 J/cm², 1030 nm, 500 fs, 10 kHz, p-pol > 0.7 J/cm², 1030 nm, 500 fs, 10 kHz, s-pol **Picosecond:** > 2 J/cm², 1030 nm, 10 ps, 10 kHz, p-pol > 3 J/cm², 1030 nm, 10 ps, 10 kHz, s-pol	**Femtosecond:** > 0.7 J/cm², 1030 nm, 500 fs, 10 kHz, p-pol > 1 J/cm², 1030 nm, 500 fs, 10 kHz, s-pol **Picosecond:** > 3 J/cm², 1030 nm, 10ps, 10 kHz, p-pol > 5 J/cm², 1030 nm, 10ps, 10 kHz, s-pol