Optically Addressed Spatial Light Modulator - VIS

FEATURES

Liquid-crystal *Optically Addressed Spatial Light Modulator*: a continuous photoconductor replaces the pixels.

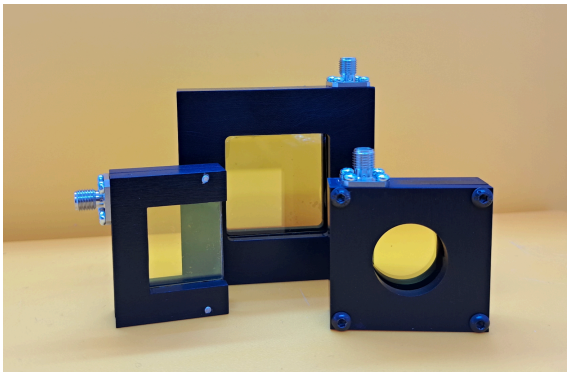
- Writing light in the visible, 400 – 600 nm
- Reading light from 400 nm to 2 µm
- Transmission (TX) or reflection (RX) mode
- Phase modulation of several π, or intensity modulation
- No pixels: 100 % fill factor, no diffraction losses
- Spatial resolution about 25 µm
- Clear aperture 20 × 20 mm, up to 35 × 35 mm

DESCRIPTION

The OASLM-VIS, also called a light valve, is a liquid-crystal layer and a photoconductor between two transparent electrodes, driven by an AC voltage. Where the writing light falls, the photoconductor becomes conductive and the voltage moves onto the liquid crystal: its molecules reorient and its refractive index changes. The reading light picks up the image written on the photoconductor, as a phase pattern or, between crossed polarizers, as an intensity pattern.

“VIS” refers to the writing wavelength: the reading light to be modulated can be different.

Each OASLM is designed for its application: the liquid crystal, its thickness and the photoconductor set the wavelengths, the speed, the sensitivity and the modulation depth. The values in this datasheet are examples measured on HOASYS devices.



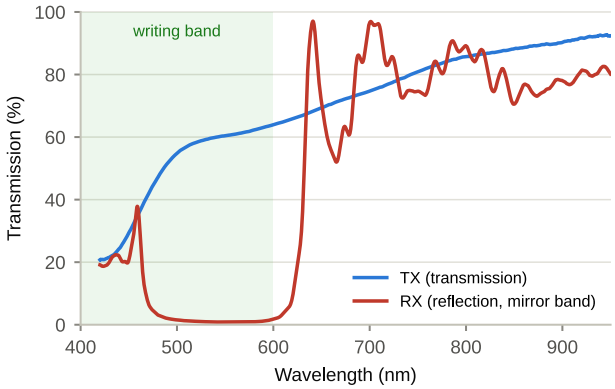
TWO CONFIGURATIONS

TX – transmission. Writing and reading light enter on the same face and the reading beam crosses the device once: the simplest set-up, for reading light that the photoconductor transmits.

RX – reflection. A dielectric mirror between the photoconductor and the liquid crystal separates the two beams: writing light on one face, reading light on the other. The reading beam crosses the liquid crystal twice, which doubles the phase shift, and never reaches the photoconductor. The reading wavelength lies in the mirror band.

TRANSMISSION SPECTRUM

Measured transmission of two devices, unpolarized light. TX: the device is transparent to the reading light outside the writing band. RX: below 2 % from 490 to 600 nm, the band where the mirror reflects the reading light.

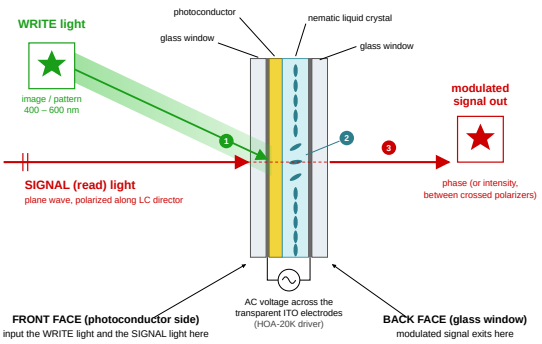


APPLICATIONS

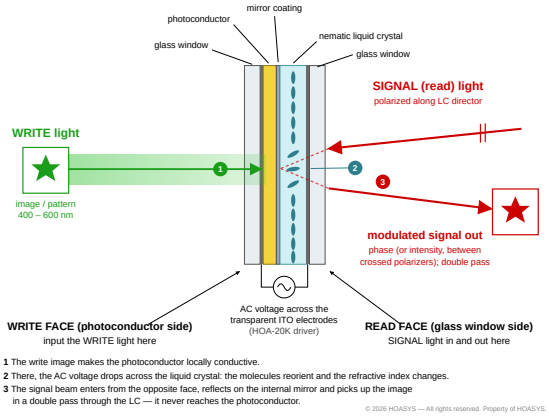
- Reconfigurable phase, intensity and polarization masks
- Laser beam shaping and beam cleanup
- Wavelength conversion
- Holography, interferometry, optical sensors
- Microscopy, imaging systems
- Nonlinear optics and optical wave-mixing
- Optical neural networks: nonlinear optical activation functions
- Optical computing and complex optics, vortex beams

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WORKING PRINCIPLE



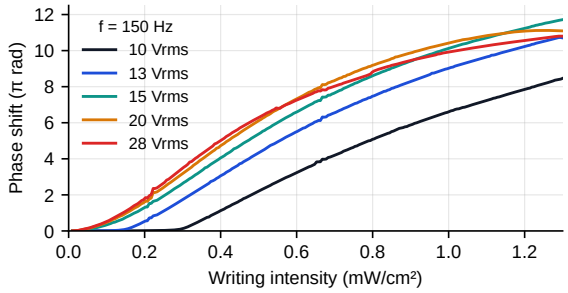
TX – transmission



RX – reflection

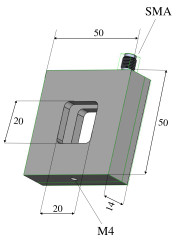
EXAMPLE OF PHASE RESPONSE

OASLM-RX, reading light at 532 nm in reflection, bias 150 Hz: phase shift against the writing intensity on the photoconductor. 8 π with less than 1 mW/cm^2, up to 12 π.



RECOMMENDED OPERATING CONDITIONS

	Min.	Typ.	Max.	Unit
AC voltage*	7	20	80	Vrms
Frequency	20	600	2k	Hz
Writing λ	400		600	nm
Writing intensity	0.05	1	18	mW/cm^2
Temperature	4	20 – 30	80	°C



Dimensions
50 mm × 50 mm × 14 mm, SMA connector.
Other sizes on request.

CHARACTERISTICS

Item	OASLM-VIS
Operating mode	Transmission (TX) or reflection (RX)
Writing light wavelength	400 – 600 nm
Reading light wavelength	400 nm – 2 µm (RX: mirror band)
Phase modulation (example: RX, 532 nm)	up to 12 π
Writing intensity (example: 8 π, RX)	< 1 mW/cm^2
Response time (example: RX)	20 – 50 ms
Spatial resolution	≈ 25 µm
Clear aperture	20 × 20 mm (up to 35 × 35 mm)
LC thickness	9 µm (other thicknesses on request)
LC alignment	Planar (phase) or twisted (amplitude)
Power consumption (15 Vrms, 1 kHz)	< 80 mW
Dimensions, weight	50 × 50 × 14 mm, 58 g
LIDT	≈ 2 J/cm^2 (10 ns, 10 Hz)**

* Sinusoidal AC voltage with no DC component; an electrostatic or DC voltage applied for several hours could permanently damage the device. All voltages are RMS values; the HOA-20K driver delivers up to 28 Vrms.
** Estimated at 1064 nm for single nanosecond pulses at low repetition rate (no heat accumulation). At higher average power and without a cooling system, thermal effects, with a reversible loss of modulation, appear first and limit the usable intensity.