

ALPAO Shack-Hartmann (SH) wavefront sensors (WFS) are the only range of WFS especially designed for Adaptive Optics (AO). They feature excellent performances to fit with every adaptive optics system. Sensitivity, speed and spectral range can be chosen depending on your needs. All **ALPAO SHs** perfectly fit with **ALPAO DMs** and **ALPAO software and real-time computers**.



Key features

OPTIMIZED FOR AO

Especially designed for adaptive optics

SPEED

Frequency up to 5kHz,
latency as low as 5 μ s
(SH-CMOS fast)

HIGH SENSITIVITY

Photon flux for SNR=1
down to 3 photons/frame/
sub-aperture (EMCCD)

OPTIMIZED FOR AO

ALPAO SHs are specifically designed for adaptive optics.

ALPAO recommends the Fried configuration for low flux high speed applications. It allows for an optimal control of your DM.

The latency has been minimized for best AO performances.

FAST WAVEFRONT SENSING

For atmospheric perturbation correction, kHz frequency wavefront sensors are needed. ALPAO WFS can be run up to 5kHz.

Beyond frequency, latency is a key parameter for real time compensation of the perturbations. ALPAO WFS interfaces are designed for extremely low latency.

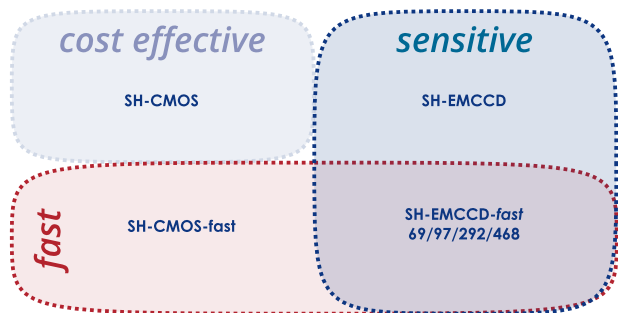
Thanks to their speed and low latency, those wavefront sensors associated with the ALPAO Real-Time Computer ACE *fast* and ALPAO DM can reach AO bandwidth greater than 100Hz.

HIGH SENSITIVITY

For some applications, like in microscopy or astronomy, a high-sensitivity wavefront sensor is required.

EMCCD technology allows great performance in terms of sensitivity thanks to very low read out noise. SH-EMCCD and SH-EMCCD-*fast* are featuring such performances.

CHOOSE YOUR VIS-WFS

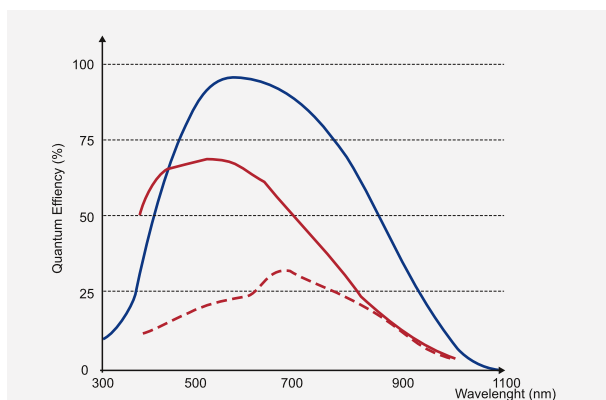


VIS WFS

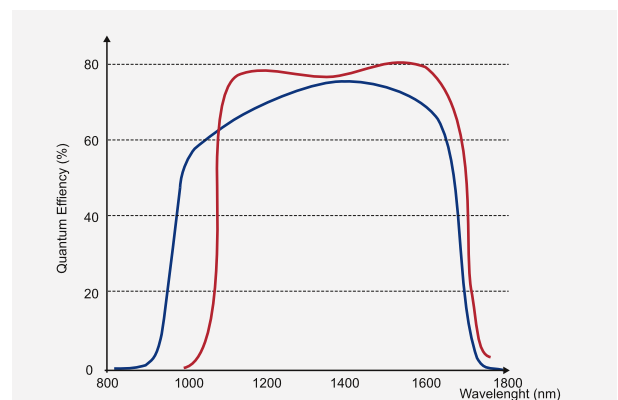
ALPAO SH-CMOS and SH-EMCCD are perfect for large spectral applications and cover the range from 350 to 1000nm.

NIR WFS

ALPAO SH-InGaAs are working in the near infra-red from 950 to 1700nm. They feature high sensitivity at 1.5µm combined with very high frequency.



Typical Quantum Efficiency of SH-EMCCD (in blue), SH-CMOS (in red) and SH-CMOS-*fast* (in dash red)



Typical Quantum Efficiency of SH-InGaAs-69 and 97 (in blue) and of SH-InGaAs-292 and 468 (in red)

ALPAO PERFORMANCES

	SIZING				SPEED			SENSITIVITY			OPTICS				
	Number of microlenses	Microlens pitch (µm)	Acquisition frequency (Hz)	Readout latency (µs)	Sensor maximum quantum efficiency	Photons for SNR=1 (ph./fr/sub-pupils)	Read-out noise (e- RMS)	Tip-tilt / defocus range (µm PV)	Repeatability (nm RMS)	Spectral range	Rejection bandwidth with ACE/fast (Hz)	Max. number of DM actuators	Interface	Cable length (m)	
SH-CMOS	50x50	96.6	99	5000	67%	100	2.1	80/20	2	VIS	5	820	USB	3	
SH-EMCCD	16x16	192	502	141	95%	3	0.1	26/7	2	VIS	25	192	CL	2	
SH-CMOS-fast	23x23	140	5670	5	35%	1000	38	50/12	2	VIS	230	468	CL	2	
SH-EMCCD-fast	-69	8x8	192	1838	64	95%	3	0.1	13/4	2	VIS	90	69	CL	2
	-97	10x10	192	1004	64		4	0.3	16/4			50	97		
	-292	19x19	192	2067	60		100	292							
	-468	23x23	192	2067	60		100	468							
SH-InGaAs	-69	8x8	240	3000	7.4	75%	1500	150	29/7	2	NIR	140	69	CL	2
	-97	10x10	240	2000	7.4		300	30	40/10			100	97		
	-292	19x19	120	3830	7.4		16/4	160	292						
	-468	23x23	120	3020	7.4		23/6	140	468						

SOFTWARE & DRIVERS

ALPAO WFS include software drivers (SDK). The SDK allows to recover spot diagrams for integration into your software or Real-Time Computer (RTC).

ALPAO WFS are designed to work with **ALPAO Core Engine (ACE)** or **ALPAO RTC (ACE fast)**. They are not included and need to be purchased separately. **ACE fast** includes the necessary hardware. The minimum configuration for ACE is 4Gb RAM, 100MB disk space, MATLAB® R2017a or higher.

CUSTOMIZE YOUR WFS

For some applications, specific needs can arise. If you have a particular requirement, get in touch with our specialists at contact@alpao.fr. We will surely be able to bring our expertise in wavefront sensing to fit with your needed performances. We can for example use almost any camera to build a wavefront sensor that fits your requirements.

WFS HOUSING



SH-CMOS



SH-CMOS-fast



SH-EMCCD-fast-69/97



SH-InGaAs-69/97

ORDER TODAY



Need more information?

Contact us for one-to-one guidance and technical support.

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