For the most demanding applications, ALPAO can provide a state-of-the-art **Real Time Computer (ALPAO *RTC*)**, a CPU linux based Real Time Computer (RTC) running up to **5kHz** with RTC latency lower than **150µs**.

Key features

SPEED

Up to 5kHz

LOW LATENCY AND JITTER

RTC latency
as low as 150µs

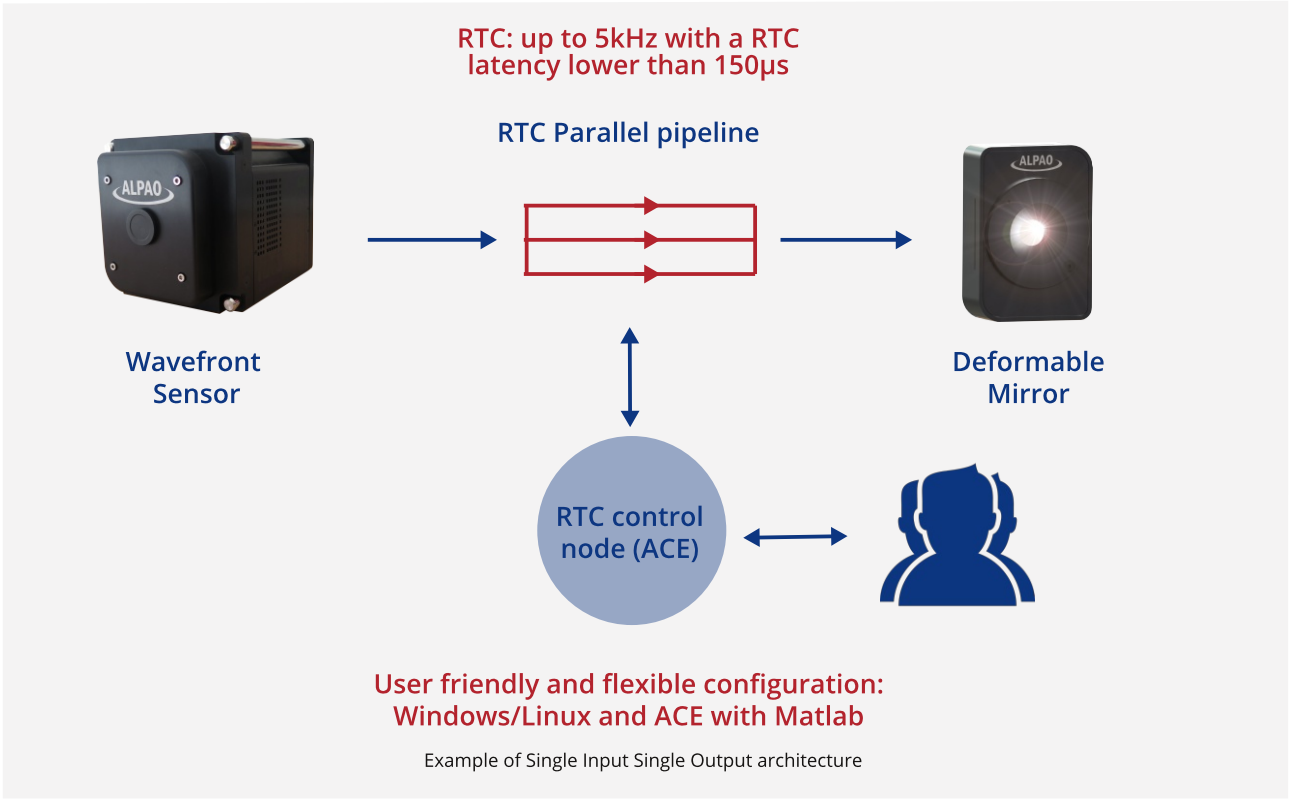
FLEXIBILITY

User-friendly and flexible
RTC control node

ALPAO RTC UNIQUE ARCHITECTURE

The RTC pipeline is specially optimized for high speed AO loop. To obtain such performances, it is hardware dependent and closed source.
The RTC control node is based on the ACE toolbox, already powering more than 100 adaptive optics systems worldwide. The ACE layer is based on the standard Matlab® environment, which allows high flexibility.

The following functionalities are provided in ACE:
- Step-by-step operation of the RTC pipeline
- Non-intrusive monitoring of all data steams
- Configuration of each worker process such as integration time, CCD gain, CCD readout mode, CCD dark and flat images for gain/offset compensation, threshold level, target centroids, partial command matrix, integrator gain, and deformable mirror offsets.
- Script-based generation of all calibration data such as reference centroids, influence matrix, dark and flat images.



Example of Single Input Single Output architecture

RTC is provided with the specific hardware already plugged in the bay (1000 x 600 x 1160mm, ~150kg, up to 4kW via a standard socket), which includes:
- The supervisor for the control node (19" x 1U x 400mm).
- The Linux multi CPU server for the fast pipeline (19" x 2U x ~900mm).

RTC OPTIONS

ALPAO RTC can be easily customized to fit your application:
- Different architectures: Single Input Single Output, Single Input Multiple Output and Multi Input Multi Output.
- Enhanced telemetry capability: large capacity storage device.
- Faster command matrix update: if your command matrix need to be refreshed at a rate above 1Hz.
- 8 channel control card: +/-10 V control on 14 bit allowing for example separate tit-tilt mirror control.
- Hardware integration, specific algorithm integration, pyramidal WFS...

More options available: contact us.

KIT PERFORMANCES

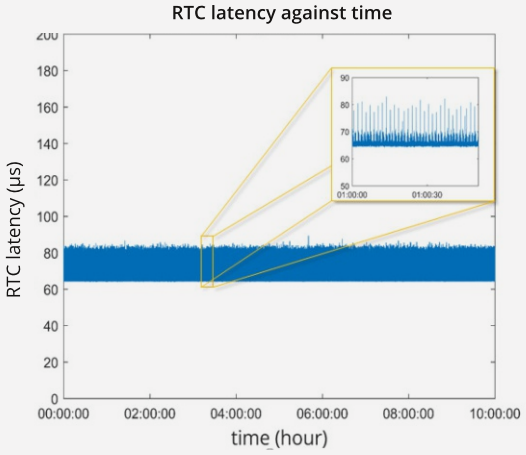
Choose the correct **ALPAO kit** depending on your application:
- the shape of your aberrations drives the number of actuators,
- the temporal fluctuations of your aberrations and the number of photons available drive the WFS and RTC choice.

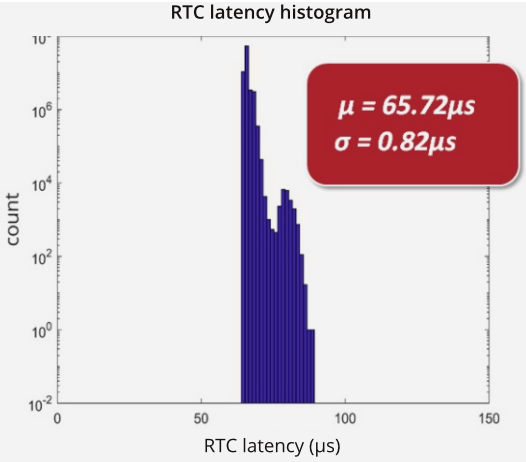
WFS sub-aperture ROI	8x8	10x10	15x15	16x16	19x19	23x23	31x31
Compatible DM (Fried geometry)	DM69	DM97	DM192	DM241	DM292	DM468	DM820

SH-CMOS *fast*	Frame rate RTC/Total latency Rejection bandwith	5000Hz 27/82µs 350Hz	5000Hz 27/91µs 335Hz	5000Hz 30/132µs 280Hz	5000Hz 32/140µs 270Hz	5000Hz 33/172µs 240Hz	5000Hz 41/227µs 200Hz	3000Hz 61/343µs 130Hz
SH-EMCCD	Frame rate RTC/Total latency Rejection bandwith	1830Hz 27/590µs 85Hz	1004Hz 27/1040µs 50Hz	1004Hz 30/1049µs 50Hz	1004Hz 32/1058µs 50Hz	n/a	n/a	n/a
SH-EMCCD *fast*	Frame rate RTC/Total latency Rejection bandwith	2067Hz 27/527µs 95Hz	2067Hz 27/528µs 95Hz	2067Hz 30/537µs 95Hz	2067Hz 32/545µs 95Hz	2067Hz 33/553µs 95Hz	2067Hz 41/580µs 90Hz	n/a
SH-InGaAs *fast*	Frame rate RTC/Total latency Rejection bandwith	5000Hz 27/244µs 215Hz	5000Hz 27/244µs 215Hz	5000Hz 30/253µs 210Hz	4760Hz 32/272µs 195Hz	3830Hz 33/330µs 160Hz	3020Hz 41/428µs 125Hz	n/a

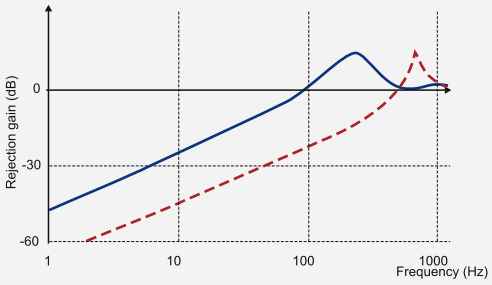
TIMING PERFORMANCES

Lost frame and jitter could have a large impact on the overall loop performances and stability. In the following example, there was zero lost frame over 10 hours while working at 2 kHz. RTC latency was very stable as shown on the following histogramm.





ALPAO high speed kit (**DM97-15**, **SH-CMOS-fast** and **ALPAO RTC**) featuring a rejection bandwith of 230 Hz.



Bode diagram example using a **SH-EMCCD-*fast*** (in blue) and **SH-CMOS-*fast*** (in dash red) with **ALPAO RTC** and a **DM292**.

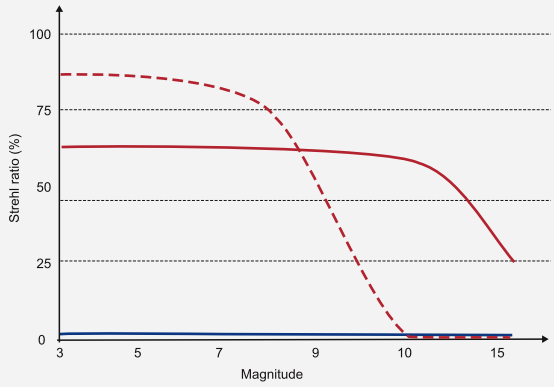
Ask for advanced simulations!

STATE-OF-THE-ART SYSTEM FOR LGS ATMOSPHERIC COMPENSATION

ALPAO can provide state-of-the-art AO systems for atmospheric turbulence compensation. Natural Guide Star (NGS) or Laser Guide Star (LGS) configuration can be provided.

Such systems typically include:
- ALPAO DM
- ALPAO *fast* WFS
- ALPAO RTC
- a calibration unit
- a Tip-Tilt Mirror (TTM)
- an object Tip-Tilt sensor
- a Focus Stage Control (FCS) for the LGS
- a LGS-TT
- a science camera or instrument
- a storage device

Typical applications are:
- Astronomy
- Debris and satellite imaging
- Free Space Optical (FSO) communication
- Laser precompensation of atmospheric aberrations



Example of Strehl ratio without AO (in blue), with LGS (in red) and with NGS (in dash red)
With D/r0 = 8 and a DM292, ACE *fast*, SH-EMCCD-fast-292

ORDER TODAY

Need more information?

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

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