

EMISSION SPECTROMETER

AOS 4-1



AOS 4-4



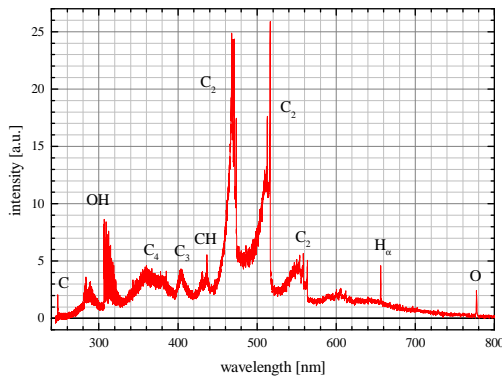
Plasma Analyzing Applications

- Time or spatially resolved plasma investigations
- Plasma process monitoring
- Plasma process design
- Plasma process control
- Chemical plasma investigations
- Reactive sputter processes
- MW-plasma
- RF-plasma

The AOS 4-1 operates in three different modes:

a) Spectral scanning mode

The spectral scanning mode delivers spectral information from a part of the specified wavelength range. For this, the wavelength is scanned, and data accumulation is performed with a measuring time of 5 up to 100 milliseconds per spectral point, depending on parameter settings. This mode allows measurements of all spectral information within the predefined wavelength range. A spectral data base can be implemented as option in software package IntelliSpec for identifying emission lines or bands.



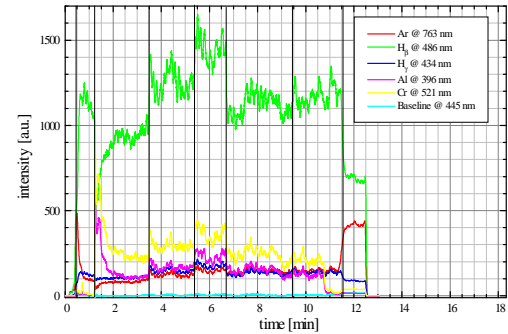
trum of CO₂/CH₄ discharge

spec

b) Chronogram / time tracking mode

The chronogram or so-called time tracking mode is possible by using the fast random wavelength access performance of the AOS. This mode allows the quasi parallel watching of up to 20 different wavelengths by fast switching between the wavelengths. As the crystal monochromator is able to be switched to another wavelength within less than one millisecond by applying another radio frequency signal, and the internal RF synthesizer is able to switch to another frequency within one millisecond, the wavelength access time is as low as one millisecond. The measurement time per spectral point itself consists of signal integration time and background signal integration time. So there can be achieved a time resolution of down to 5 milliseconds per spectral point. Total time resolution of this mode is the value of predefined measuring time per spectral point multiplied with the number of wavelength's to be monitored. Additionally an analogue output signal can be

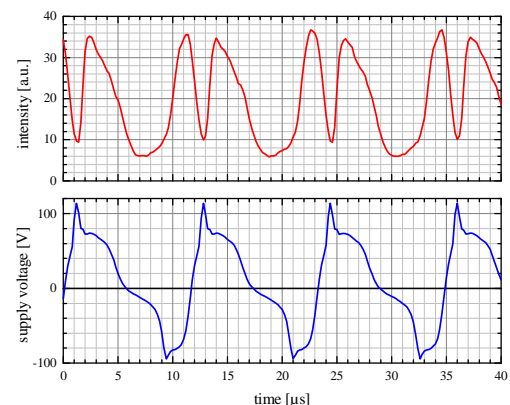
implemented into the AOS 4-4 for process control. Using the so called DAC-option emission intensities or their mathematical operation can be allocated as analogue output signal (0...10V).



time resolved measurement in different process stages

c) Pulse mode (optional)

The pulse mode is achieved by sampling the photo signal by a fast AD converter. This mode provides a time resolution down to 20ns. The measurement must be triggered by an external trigger signal, which may be derived from the pulse plasma power supply or from an external signal generator. In this mode it is possible to make single shots on different wavelength, each after each other. For this, a wavelength table is implemented to the software package. The external trigger signal can be an analogue signal $\pm 1V / 50\Omega$ or ttl-signal. If you use the digital ttl-signal the analogue input can be used as additional external measurement input.

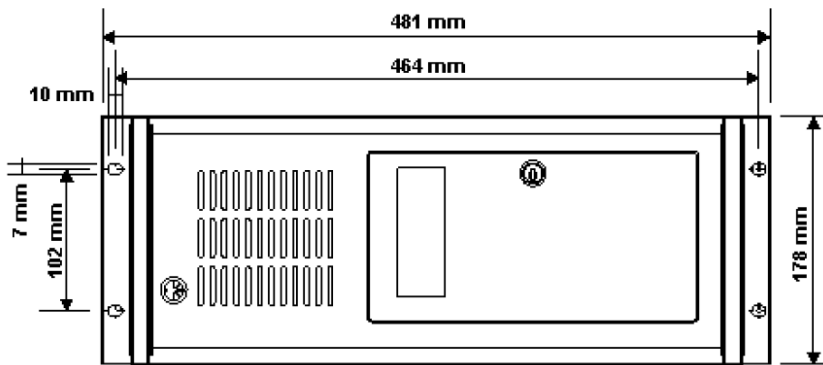


time dependency of intensity versus the exciting synch signal in pulse mode



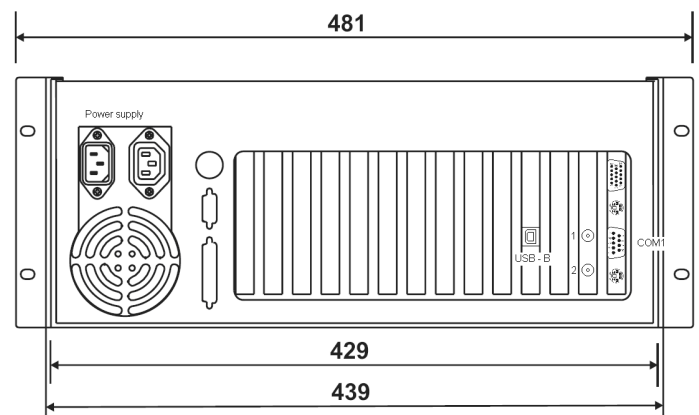
Technical Data AOS 4

PROPERTY	AOS 4-1	AOS 4-4
spectral range	250 nm 800 nm	
entrance optics	fibre coupling \varnothing 200 μ m	4 x fibre coupling \varnothing 200 μ m
wavelength accuracy	\pm 0,2 nm max.	
wavelength resolution	0.05nm@253.6nm(Hg) 0.5nm@763nm(Ar)	
minimal wavelength step	0,02 ... 0,2 nm	
effectiveness about the total system	15 - 20%	10 - 15%
dynamic range	50dB Standard, 60dB with refrigerated photo multiplier	50dB Standard
PMT voltage	200-1200V	200-900V
nonlinearity of the photo signal	<2%	
time resolution	spectrometer chronogram pulse mode	t: 5...100ms n x t, n=1..20 0,02 μ s....10 μ s
data memory onboard	10000 time steps	
analogue – digital conversion	standard 16 Bit 10ms, 10 Bit 0,2 μ s	
plasma modulation for the μ chron- Regime	external modulation synchronous input \pm 1V 50 Ω	
working conditions	temperature 20,0 \pm 15,0 $^{\circ}$ C, relative humidity 65 \pm 20% , atmospheric pressure 100 \pm 8 kPa, (760 \pm 60 Torr)	
power requirements	230 \pm 15V, 50..60 Hz, 100W max.	
warm up time	30 min	
permitted continuous operating-time	24h min.	
sizes	optional 19"-case complete assembled	
weight	15 kg	16 kg



AOS 4-1 and AOS 4-1 μ chro layout of the front side

The fibre optic input and power-on switch is placed behind the shielding on the right.



Spectrometer AOS 4-1 (without plugs 1 and 2), and AOS 4-1 μ chro (pulse option with plugs 1 and 2) layout of the back side

Connectors available for AOS 4-1 and for AOS 4-1 μ chro:

- USB-B USB 1.2 full speed connector – standard communication port. On request COM1 can be configured as standard communication port.
- Power 85...265VAC 50/60Hz 200W

Connectors available for AOS 4-1 μ chro (pulse option) only:

- 1 BNC female analogue trigger input $\pm 1V$ 50 Ω ; trigger level adjustable
- 2 BNC female digital trigger input 0...5V, 10k Ω