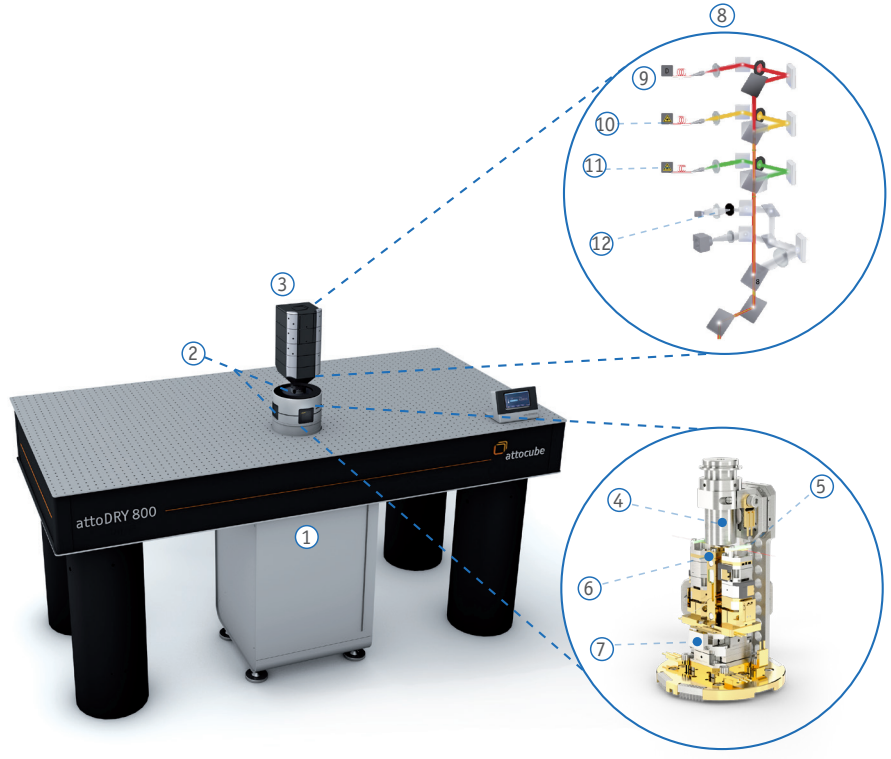
Specifications

cryogenic Photonic Probe Station

General Specifications	
type of instrument	combined side injection into planar waveguide structures and perpendicular confocal optics on top of the sample, perpendicular injection is possible
sensor head specifics	two independent lensed fiber probes with 3 individual degrees of freedom, low temperature compatible apochromatic objective and external confocal optics head
Confocal Unit	
configuration	compact and modular design, two or more optical channels standard configuration: 1 excitation channel,1 detection channel
quick-exchange of optical components	beamsplitters, filter mounts for up to 4 filters/ polarizers (1" diameter), optional piezoelectric rotator with filter mount
LT- compatible objective	LT-APO/VIS, LT-APO/VISIR, LT-APO/NIR (see accessory section for more information)
inspection unit	sample imaging with large field of view: approx. 100 µm
long-term stability	lateral drift of confocal spot typically <2 nm/h
Sample Positioning	
total travel range	Sample: 6 mm x 6 mm (closed loop) fiber probes: 3 x 3 x 2.5 mm³ (closed loop) sensor resolution approx. 200 nm, sensor repeatibility approx. 1-2 µm
step size	0.05..3 µm @ 300 K, 10..500 nm @ 4 K
sample holder	carefully thermalized, quick exchange mechanism, including calibrated temperature sensor and heater
temperature range	4..320K
operating pressure	1E-6 mbar .. 1 bar
Suitable Cooling Systems	
compatible cryostats	attoDRY800 (flow cryostats on request)
laser	LDM600 laser/detector module (for detailed specifications please see attoCONTROL section)

Cryogenic Photonic Probe Station

combined probe station and confocal microscopy



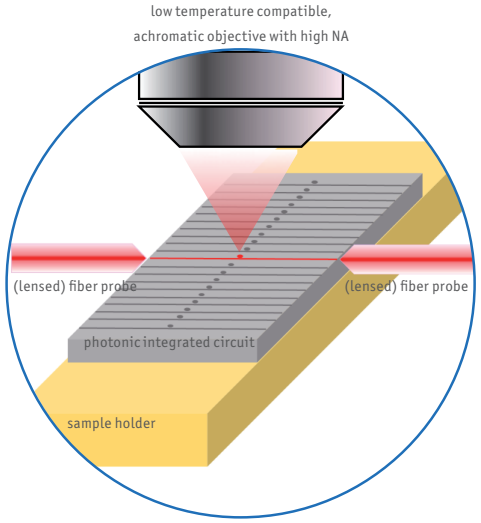
01 attoDRY800 cryostat
02 optical access to sample
03 multi-beam optical head
04 LT high NA objective with z focus
05 lensed fiber for light coupling into waveguide with xyz degrees of freedom
06 removable sample holder
07 xy degrees of freedom for complete setup of sample and fiber probes
08 optical head schematics
09 detection channel
10 excitation channel
11 second excitation channel (optional)
12 inspection optics

Photonic Integrated Circuits (PIC) are hot candidates for becoming the key components of the next generation of optical and quantum communication systems because of the promise of very high information transfer speed, robustness and the compatibility with standard microelectronics devices technology. Furthermore, the extremely high sensitivity of resonant nanophotonics structures to light-matter interactions makes them candidates for a new classes of sensors with broad range of possible applications in physics, biology and chemistry. The Photonic Probe Station, which combines two optical fiber probes and a free optical beam Confocal Microscope (CFMI) provides an ideal, ultra stable, extremely compact and easy-to-use table top setup for nano photonic device characterization. The lensed fibers couple light into and out of the the sample planar wave guides. The confocal microscope allows not only for sample surface probing, but also for out-of-plane coupling into photonic structures. The combination with the attoDRY800 cryo-optical table offers a powerful easy-to-use setup for characterization of photonic nanostructures in a temperature range from 4 K up to 320 K.

NEW

Selected Applications

Cryogenic Photonic Probe Station

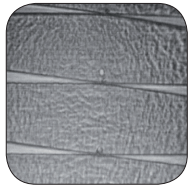


CUSTOMER FEEDBACK

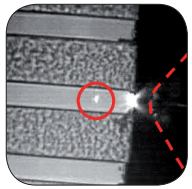
Dr. Ivan Favero

The photonic probe station has essentially solved cryogenic and mechanical stability problems in our experiments, such that we can today concentrate our efforts on other conceptual and technical aspects. Simply a great scientific instrument!

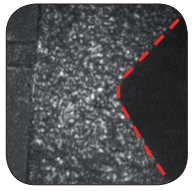
(Université Paris Diderot, CNRS, Paris, France)



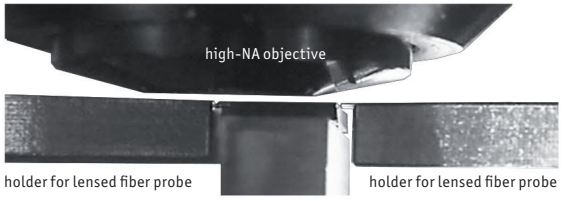
Nano-resonators and planar wave guides

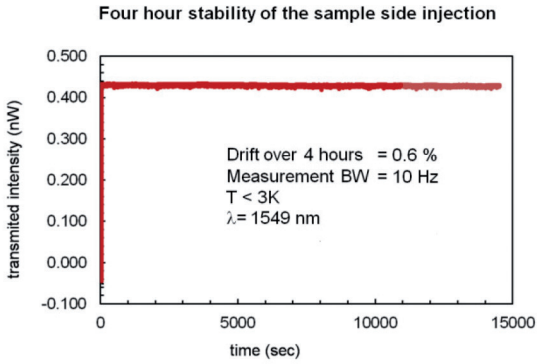


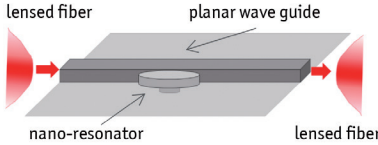
Coupling from the lensed fiber (red dashed line) into the planar wave guide; the red circle indicates the confocal spot



Lensed fiber (red dashed line) at the edge of a planar wave guide sample (courtesy of Ivan Favero, Université Paris Diderot-CNRS)







Ultra-Low Drift

The integration of the Photonic Probe Station into the attoDRY800 cryostat allows for characterization of photonic structures in a temperature range from 4 K up to 320 K.

The stability of the light injection and detection is outstanding: ultra low drift of the transmitted signal intensity in the range of only a few percent in a period of several days is detected. A typical 4 h measurement is presented. The experiment schematics is shown below.

PRODUCT KEY FEATURES

- large area sample positioning (6 mm x6 mm)
- 2 independently movable optical probes (lensed fibers)
- ultra low drift at low temperature

BENEFITS

- quick and easy sample exchange
- inspection optics 90 µm x 70 µm (field of view)
- accurate & flexible *in-situ* optical probing of photonic nanostructures

APPLICATION EXAMPLES

- characterization of nanophotonic structures
- spectroscopy of single QD in nanoresonator
- biosensors
- nano-plasmonics
- opto-electronics devices