

UCD CSN Supplemental Information #277

Hardware Specifications of the HIPS System

*Chemical Speciation Network
Air Quality Research Center
University of California, Davis*

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This supplemental information (SI) specifies the hardware used in the measurement of optical absorption for PM_{2.5}-loaded polytetrafluoroethylene (PTFE) filters collected in the Chemical Speciation Network (CSN) using the Hybrid Integrating Plate/Sphere (HIPS) system.

For system description and explanation of the calibration process, see:

Warren H. White, Krystyna Trzepla, Nicole P. Hyslop & Bret A. Schichtel (2016) A critical review of filter transmittance measurements for aerosol light absorption, and *de novo* calibration for a decade of monitoring on PTFE membranes, *Aerosol Science and Technology*, 50:9, 984-1002, DOI: 10.1080/02786826.2016.1211615

A schematic of the HIPS system is shown below, followed by tables specifying the commercially-available components.

Figure 1. Overview of the hardware components of the HIPS system.

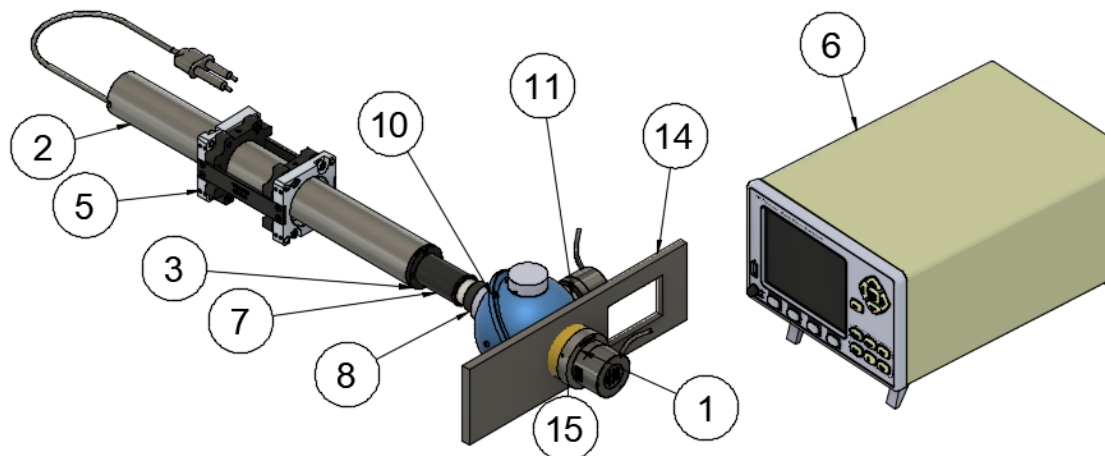


Table 1. HIPS System Assembly Components.

Instrument	Assembly	Sub-assembly	Diagram #
Light Absorption Instrument	Light Source	Laser	2
		Shutter	3
		Cage mount for laser	5
		Incident Light Collimator	7
		Adjustable Lens Tube	8
	Reflectance	Integrating Sphere	10
		Reflectance Detector	11
	Sample Changer	Not described	14
	Transmittance	Integrating Plate	15
		Transmittance Detector	1
	Electronics	Detector Power Meter	6

***Note: does not include structural parts or sample changer mechanics, electronics, or automation.**

Table 2. HIPS System Bill of Materials.

Sub-assembly	Part #	Supplier	Description
Laser	HNL050R	Thor Labs, thorlabs.com	HeNe laser, 632.8 nm, 5.0 mW, with power supply
	SM05AHN	Thor Labs, thorlabs.com	Laser to SM05 external thread adapter
	HCM2	Thor Labs, thorlabs.com	XY adjustable HeNe Mount for 60 mm Cage system
Incident Light Collimator	SM1M20	Thor Labs, thorlabs.com	SM1 internally threaded lens tube, 2" long
	SM1A6	Thor Labs, thorlabs.com	SM05 internal to SM1 external threaded adapter
	SM1AD15	Thor Labs, thorlabs.com	Externally SM1 threaded for 15 mm dia. Optic, 0.40" thick
	SM1V10	Thor Labs, thorlabs.com	1" dia. Externally SM1 threaded adjustable lens tube, 0.81" travel range
	SM1AD6	Thor Labs, thorlabs.com	Externally SM1 threaded adapter for 6 mm dia. optic, 0.40" thick
	SM1T2	Thor Labs, thorlabs.com	Externally SM1 threaded coupler, 0.5" long
	SM1L03	Thor Labs, thorlabs.com	SM1 lens tube, 0.30" thread depth, one retaining ring, ext. SM1 and int.
	EO 48-265	Edmond Optics, edmundoptics.com	6 mm dia. x -6 FL, VIS 0 deg. Coated, plano-concave lens
EO 47-876	Edmond Optics, edmundoptics.com	15.0 mm dia. x 60.0 mm FL, VIS 0 deg. Coated, Plano-Convex Lens	
Integrating Sphere	819C-SL-3.3	Newport, newport.com	Integrating sphere, 4-port, 3.3in diameter, Spectralon, 0-deg. 1.5 in. port plug
	819M-PP-1.0	Newport, newport.com	Port plug, 1.0 inch port, Spectralon, for integrating spheres
	819M-SM1-1.0	Newport, newport.com	SM1 internal thread to 1" sphere port adapter (for laser collimator to sphere)
Integrating Plate	LT-S-10E20N	Newport, newport.com	Step adapter, 1" to 2" lens tubes (for plate lens tube)
	LT20-05	Newport, newport.com	2" lens tube, 1/2" length (for plate ND and diffuser)
	LT20-RR	Newport, newport.com	2" retaining ring (for plate lens tube)
	884-UDAPT	Newport, newport.com	Universal Oriel and lens tube adapter, 818 & 918D series sensors
	SM1L03	Thor Labs, thorlabs.com	SM1 lens tube, 0.30" thread depth, one retaining ring, ext. SM1 and int.
	N/A	Industrial Optics Unlimited, iouoptics.com	flashed opal diffuser, 50mm dia. X 1/8" thick
Reflectance Detector	65-814	Edmond Optics, edmundoptics.com	50 mm diameter, 0.6 OD absorptive ND filter
	918D-SL-OD3R	Newport, newport.com	Silicon photodiode detector with OD3 attenuator (for sphere)
	819M-DAT	Newport, newport.com	918 series detector adapter for 1" sphere port (for detector to sphere)

Transmittance Detector	918D-SL-OD3R	Newport, newport.com	Silicon photodiode detector with OD3 attenuator (for sphere)
Detector Power Meter	2936-R	Newport, newport.com	Dual channel benchtop optical power and energy meter
