

Hydrogen Fluoride Free Space Gas Cell for Gas Sensing and Calibration in O Band (1300nm)

Gas cells are precision filters whose absolute wavelengths depend on specific molecular energy level transitions. Hydrogen Fluoride (HF) exhibits strong molecular absorption in the bands 865 - 895nm, 1255 - 1351nm, and 2.34 - 2.82 μ m.

Our OFHC copper gas tube is compression-sealed for long life and features advanced optical design with wedged sapphire windows for very low level of interference artifacts.

Free-space gas cells come in standard pressures of 10 Torr and 50 Torr with a backfill material of nitrogen gas (N₂).

Cells area also available fully fiber-coupled (single mode fiber, with or without connectors), or with a built-in InGaAs photodetector on one end.

Specifications¹

Gas Lines:

Wavelength Range	nm	1255 to 1351 865 to 895 (tube only) 2.34 μ m to 2.82 μ m (tube only)
Wavelength Accuracy	pm	\pm 0.1pm (see following page)
Absorption line depth ² (P3 line - 1312.6nm)	dB	6 (50 Torr; typ.) 4 (10 Torr; typ.)
Linewidth (P3 line - 1312.6nm)	pm	16 (50 Torr; typ.) 5 (10 Torr; typ.)
Temperature Dependence	pm	<0.01/ $^{\circ}$ C
Custom Pressures (25 $^{\circ}$ C) ³	Torr	0.3 to 150 \pm 10%

Gas Cell:

Cell Transmission	%	45
Spectral ripple (P-P)	dB	<0.1 P-P in any 2nm span
Cell Lifetime	years	>10
Operating temperature	$^{\circ}$ C	+5 to +70
Storage temperature	$^{\circ}$ C	-40 to +80
Connector Type		FCAPC, SCAPC, FCPC, SCPC, none, PD(Photodetector)

Photodetector:

Net Responsivity	AW	>0.4
Capacitance (0V)	pF	4 typical
Shunt Resistance	M Ω	>5

1. 25 $^{\circ}$ C; Specifications subject to change without notice
2. For instruments with resolution better than the linewidth. Using lower resolution could understate absorption.
3. 150 Torr maximum for pure HF. Total pressures of 1000 Torr possible depending on concentration. Consult factory for more information.



- >10 year life, compression seal (sapphire to copper)
- Sapphire windows are AR-coated and wedged for low level of spectral artifacts
- Free-space tube in a variety of path lengths
- Rugged miniaturized package
- Custom pressures and concentrations available.
- Fully fiber coupled options with connectors or PD

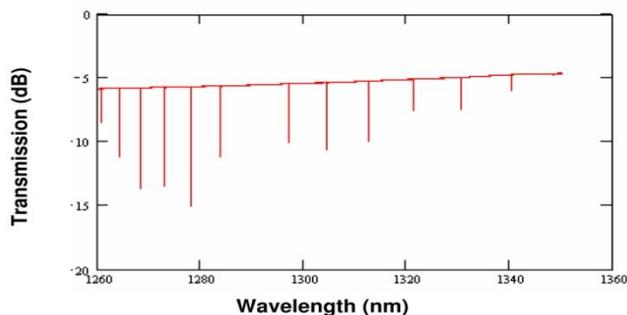
Applications

- Remote optical gas sensing systems
- Gas bump testing
- Embedded calibrator for tunable laser or OSA
- Wavelength locker
- Laboratory calibration source

Ordering Information (example)

HF-T(2.5)-50

T(2.5): free space tube Pressure (Torr)



Traceability

The resulting absorption spectra exhibited by Wavelength References HF Cells are determined by fundamental molecular energy level transitions that have been well characterized by standards bodies and stored in spectroscopic databases such as HITRAN. As such, the presence of HF at a specified pressure and temperature guarantees repeatable absorption spectra characteristics.

Line	Wavelength (nm) ^{1,2}	Pressure Shift ³ (pm/Torr)
R(8)	1253.3845	-0.010
R(7)	1255.3002	-0.010
R(6)	1257.7520	-0.008
R(5)	1260.7417	-0.006
R(4)	1264.2721	-0.003
R(3)	1268.3469	-0.001
R(2)	1272.9705	0.004
R(1)	1278.1480	0.004
R(0)	1283.8857	0.009
P(1)	1297.0703	0.003
P(2)	1304.5339	0.004
P(3)	1312.5910	0.002
P(4)	1321.2525	-0.002
P(5)	1330.5301	-0.003
P(6)	1340.4365	-0.006
P(7)	1350.9858	-0.009
P(8)	1362.1931	-0.010

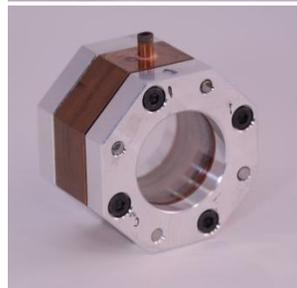
1. Data from most recent HITRAN 2012 database. Significant updates were made from the previous 2008 database.
2. HITRAN line uncertainty given in terms of wavenumber: <0.0001cm⁻¹ and >= 0.00001cm⁻¹).
3. Air-broadened pressure shift data at 296K from HITRAN 2012.
- 4.

Note: HITRAN is a spectroscopic database involving research and standards bodies worldwide. It is headquartered at the Harvard Smithsonian Center for Astrophysics and contains the most accurate spectroscopic data in the world.

A Note on Dimers: The dimer H₂F₂ is generally present to varying concentrations depending on gas pressure and temperature. For room temperature (25 °C) at 100 Torr pressure the dimer concentration will be in the neighborhood of 25%. For pressures below 25 Torr the dimer concentration is generally negligible at room temperature and above. The presence of the dimer effectively reduces the concentration of the monomer but does not change the wavelength of the absorption lines except through the weak dependence on pressure shift. The most evident effect will be the absorption width getting larger at higher temperatures due to the increase in monomer concentration.



75mm clear aperture x 17mm



25mm clear aperture x 15mm



10mm clear aperture x 25.5mm *

*Additional configurations available.

Material Handling

Occupational Safety & Health Administration (OSHA) lists a Permissible Exposure Limit (PEL) for HF of 3ppm over an 8-hour period (time-weighted average). Our 50 Torr cells contain approximately 0.02mg to 0.4mg of HF, depending on tube size. are far below any quantity deemed hazardous by OSHA, Cells may be shipped by any customary means.