NoiseBlock™ 90/10 Beamsplitter Filters

For Ultra-Low Frequency Raman spectroscopy with High Signal-to-Noise

NoiseBlock™ 90/10 beamsplitter filters are designed to diffract 90% of the incoming light that matches the designed Bragg wavelength (λ0) and incident angle. All other wavelengths will be transmitted through the filter, making them excellent for boosting the effective signal of a Raman spectrometer.

Adding a NoiseBlock™ 90/10 beamsplitter filter to a Raman spectrometer with a wavelength stabilized laser source can increase the recovered Raman signal by almost a factor of 4, relative to a broadband 50/50 beamsplitter. The additional Anti-Stokes signal boosts the available signal by nearly a factor of 2 in the THz range compared to long pass filter.

The filter's narrow spectral profile (HWHM <10 cm^{-1}) is designed to match the SureBlock™ ultra-narrow-band notch filter, making it ideal for enabling ultra-low frequency Raman spectroscopy with high signal-to-noise.

FEATURES

- High reflection at design wavelength
- Narrow spectral bandwidth
- Access to both, Stokes and Anti-Stokes Raman
- Customizable slant angle for angular separation of beams
- Environmentally stable at high temperature and humidity
- No degradation under high power illumination conditions

APPLICATIONS

- Low Frequency /THz-Raman Spectroscopy
- 90/10 beamsplitter
- Increased SNR / faster Raman imaging speeds by combining Stokes and Anti-Stokes signal
- Spatial mapping of temperatures in solid, fluid and gaseous media
- Removal of broadband ASE, fluorescence, and unwanted laser line emission

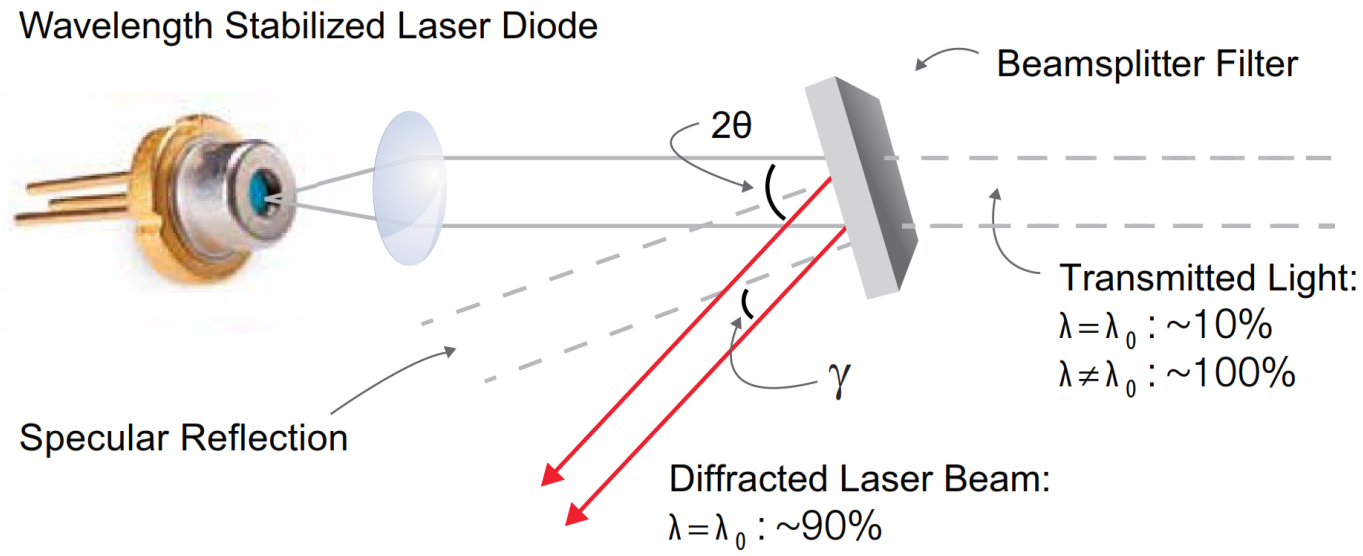
Attalon

Specifications	Typical
Center Wavelength (nm)	488, 514, 532, 633, 640, 658, 685,690, 780.25, 785, 808, 830, 976, 1064, 1550
Bandwidth[1] (HWHM) cm^{-1} GHz	 < 10 < 300
Diffraction Efficiency (%)	>90
Temperature Dependence (nm/°C)	0.01
Total Deflection Angle (2θ) (degrees)	8 to 12
Slant Angle (γ) (degrees)	2
Clear Aperture Diameter	9 mm in 1" mount. Custom sizes available

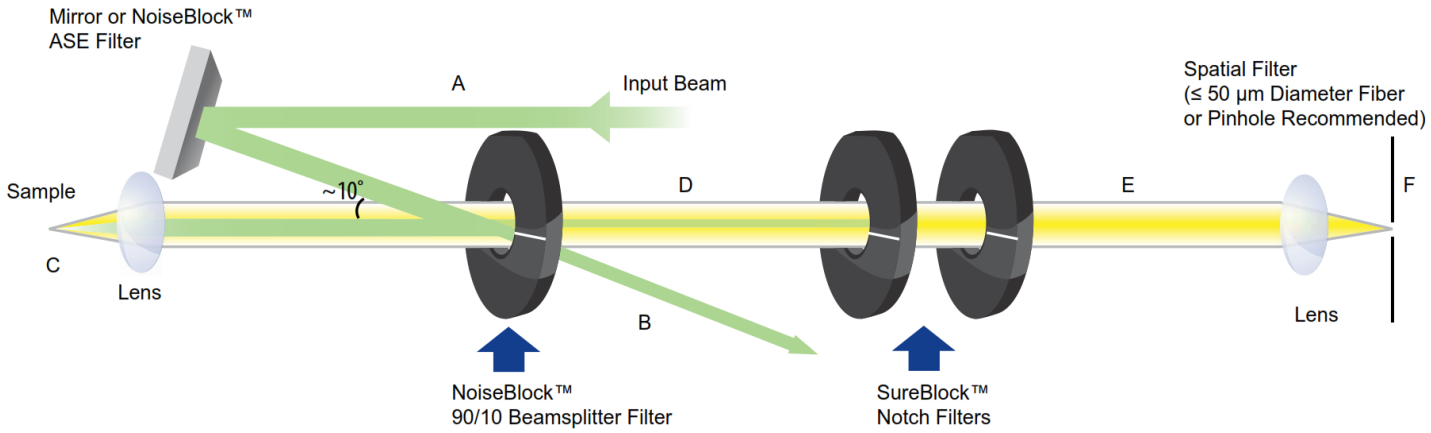
[1] Grating bandwidth is a function of wavelength and thickness.

Principle of Operation

NoiseBlock™ 90/10 beamsplitter filters are designed to reflect only the desired single frequency line (λ0) from a wavelength stabilized laser. The slant angle is chosen to separate the diffracted beam and the low residual surface reflections



Principle of Operation

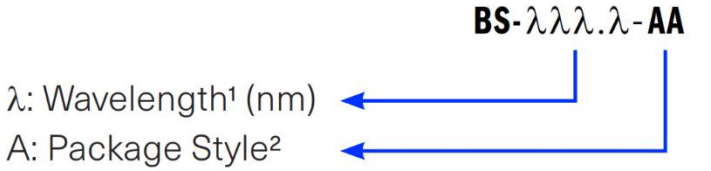


A high throughput, low frequency Raman spectroscopy system can be assembled by combining a NoiseBlock™ 90/10 beamsplitter with two SureBlock™ notch filters and optional NoiseBlock™ ASE suppression filters. The resultant system is capable of measuring Raman signals as low as <10 cm^{-1} from the laser line.

90% of the input power matching the design wavelength (A) is diffracted by the beamsplitter toward the sample with all other wavelengths transmitted through the beamsplitter. After excitation of the sample, the beamsplitter diffracts 90% of the Rayleigh scatter toward the laser but transmits the entire Raman signal. The result is a ~4X signal boost compared to a broadband 50/50 beamsplitter that reflects only half the excitation light towards the sample and then splits half the Raman signal away from the spectrometer path.

Specifications	Broadband 50/50 Beamsplitter	NoiseBlock™ 90/10 Beamsplitter
Power at sample (C)	50%	90%
Raman signal after beamsplitter (D)	50%*50%=25%	90%*100%=90%
Rayleigh signal after beamsplitter (D)	50%*50%=25%	90%*10%=9%

Ordering Information



Notes:
1. Specified in vacuum to 0.1nm accuracy required for non-gas lines.
2. FS = Standard 1" round mount, XX = Unmounted

NoiseBlock™ 90/10 beamsplitter filters are reflective volume holographic gratings (VHGs), produced in a proprietary glass, ensuring excellent part-to-part repeatability.