Compact Beam Sampler

Introduction

The Compact Beam Sampler (CBS) will sample a small percentage of a beam's power for short working distance measurement applications where the original beam's power density would otherwise damage the measurement instrument or standard absorptive ND filters. The CBS samples the transmission through a high damage threshold angled mirror to safely reduce the power of high intensity light. An ND filter optically glued to the rear of the mirror eliminates unwanted interference effects from multiple reflections.

Theory of Operation

The Compact Beam Sampler consists of a high reflectance dielectric reflector on a glass substrate optically glued to an ND2 absorbing filter and mounted at a 10 degree angle from the optical axis. The index matched ND filter suppresses interference fringing on the transmitted energy. >99% of the input energy is reflected from the mirrored surface to a direction that depends on the final rotation orientation of the CBS after screwing onto the beam profiler and adjusting the knurled locking ring. A small percentage of the beam transmits through the mirror and ND filter to the beam profiler. This design allows for handling high amounts of power in a very short optical length. Users must consider how the beam reflected at 20 degrees may or may not interact with the incident beam and its optics/mounts/laboratory environment etc.

Figure 1: Compact Beam Sampler

Safety

Always follow proper laser safety protocol when working with lasers of any power (refer to ANSI Z136.1). Be sure to understand the light's path, including every reflection/transmission. The CBS will reflect >99% of power off the mirror at an angle 20 degrees from the optical axis in a direction that depends on the final rotation orientation of the CBS after screwing onto the beam profiler and adjusting with the knurled locking ring. The excess reflected power should be properly and safely handled. DataRay offers an optional BeamTrap that can safely absorb up to 50 W. Be cautious and assume that the beam trap or any other element absorbing energy will be hot.

****** IMPORTANT *** It is a specific condition of use that the customer/user ac-***

cepts complete responsibility for laser safety in terms of the >99% of the incident beam which is reflected from the front surface.

System Setup

Hardware Setup

The following parts will be included with the CBS. Follow the assembly steps to mount to a camera or scanning slit beam profiler.

Parts List

- (1) Compact Beam Sampler with C-mount external threads
- (1) SM1 Protective Cap
- (1) C-mount Protective Cap
- (1) BeamTrap (*Optional accessory*)
- (1) External SM05 to internal C-mount adapter (*For mounting to scanning slit profilers*)

Assembly

1. Remove the protective C-mount cap and use the external threads to attach to the camera.
    - Scanning slit beam profilers have SM05 threads and will use an adapter.
2. Adjust the rotation of the CBS with the knurled locking ring to choose the direction of the reflected beam.
3. Mount the assembly such that the laser enters normal to the beam profiler. The mirror will be angled at 10 degrees from normal.
4. Mount a beam trap in a position to absorb the reflected beam.
5. Remove the protective SM1 cap before use, and replace after to prevent contamination of the mirror surface.

Figure 2: Compact Beam Sampler mounted on a WinCamD-LCM beam profiler.

Attenuation

The attenuation is calculated as a combination of the transmission through the mirror and the transmission through the ND-2 filter. Figure 3 shows the sampled percentage and optical density vs wavelength for a beam with average polarization. Since the incident angle is only 10 degrees, the change in attenuation for polarized beams is insignificant. Please refer to CBS_SampledOutputVsWavelength.xlsx for a spreadsheet to provide attenuation values for specific wavelengths.

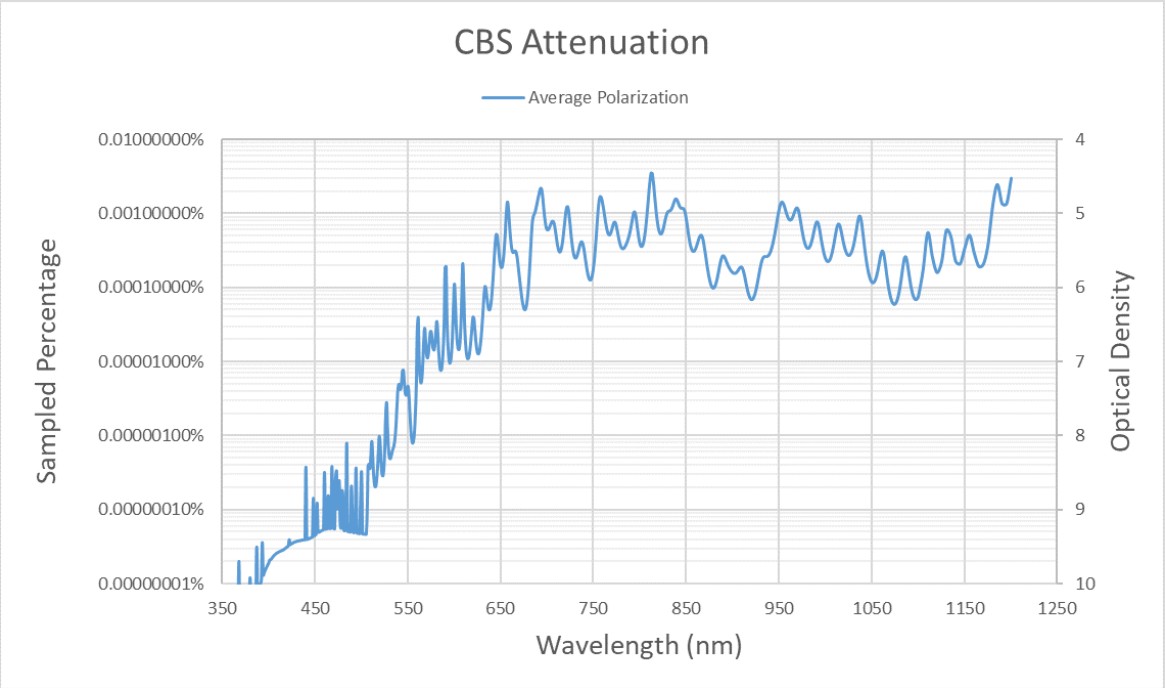

Figure 3: Sampled Percentage of the beam transmitted through the Compact Beam Sampler.

Damage Threshold

Be sure that the power hits within the optical surface, not the anodized surround. The damage threshold is 1 kW/cm^2 for up to ~500 W total incident power for 350 - 1100 nm. The damage threshold for pulsed lasers is 1 J/cm^2 @ 355 nm, 2 J/cm^2 @ 532 nm, and 6 J/cm^2 @ 1064 nm (All at 10 ns pulse width).

Outline and Mounting

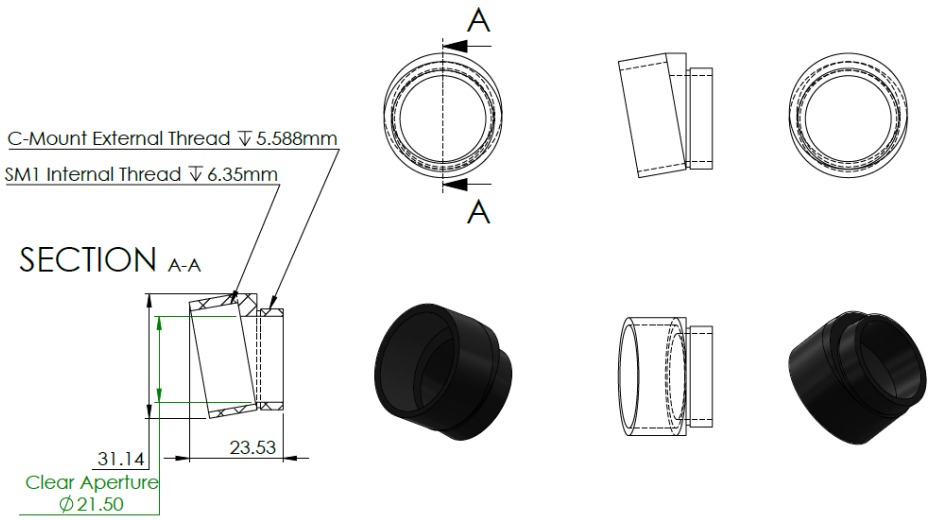

Figure 4: Compact Beam Sampler dimensions and drawing.

Circular X/Y target sticker must be removed from front of BeamMap2/BeamR'2 before mounting.

Figure 5: CBS shown mounted on WinCamD-LCM & BeamMap2/Beam'R2. User set/locked orientation.