

Observation of Coherent Backscattering for Detection of Physical State Changes

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Theory

Coherent backscattering is an interference effect that occurs due to the constructive interference of light paths.

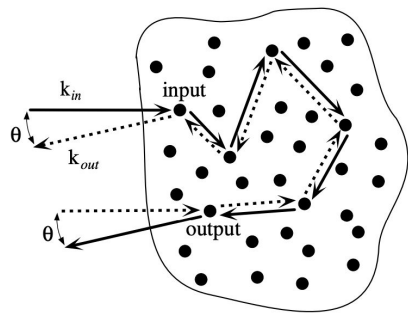


Figure 1. “Labeyrie, G., et al. (2000). *Observation of coherent backscattering of light by cold atoms. Journal of Optics B: Quantum and Semiclassical Optics*, 2(5), 672–685. doi:10.1088/1464-4266/2/5/316

It leads to an enhanced intensity cone and can be used to detect physical state changes in random media.

Optical Alignment

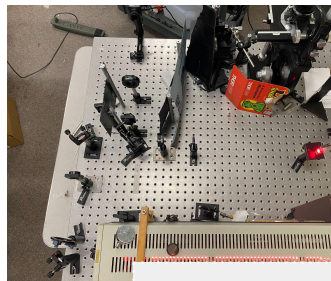


Figure 2. The optical set up used to detect the CBS signal

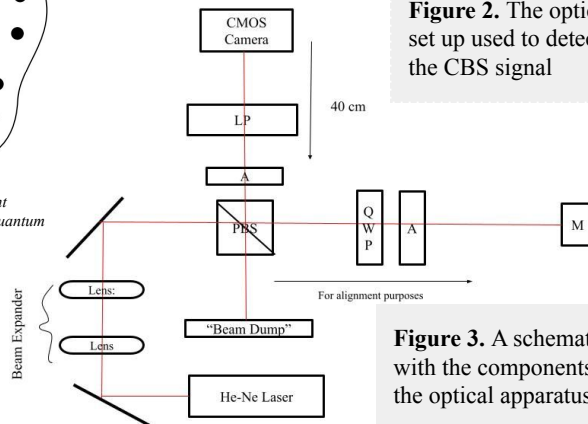


Figure 3. A schematic with the components of the optical apparatus.

Results

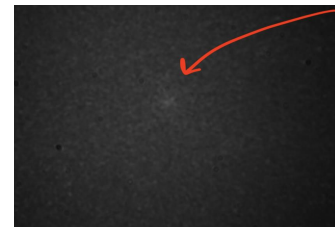


Figure 4. Observed signal.

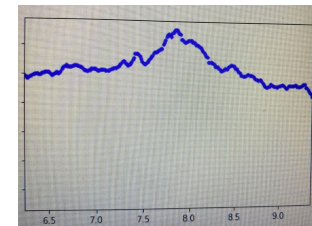


Figure 5. A lineout of Fig. 4

Applications/Future Work

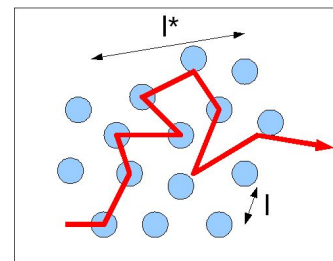


Figure 6. “Transport Length.” Wikipedia, en.wikipedia.org/wiki/Transport_length.

$$l^* = \frac{\ell}{1 - \langle \cos \theta \rangle}.$$

- Changes in concentration, density, color, temperature
- Protein vaccine denaturation
- Material reflectivity + other characteristics