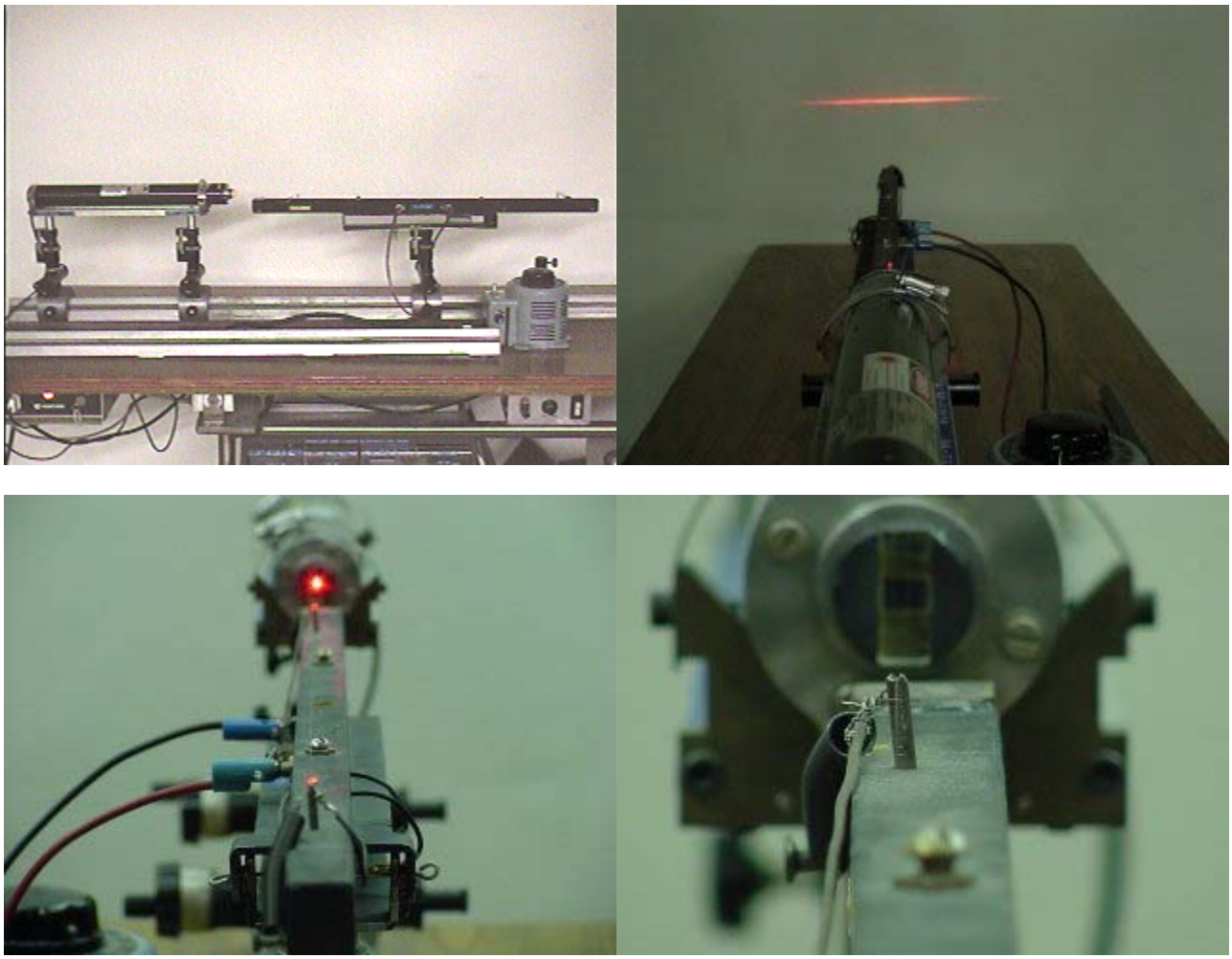
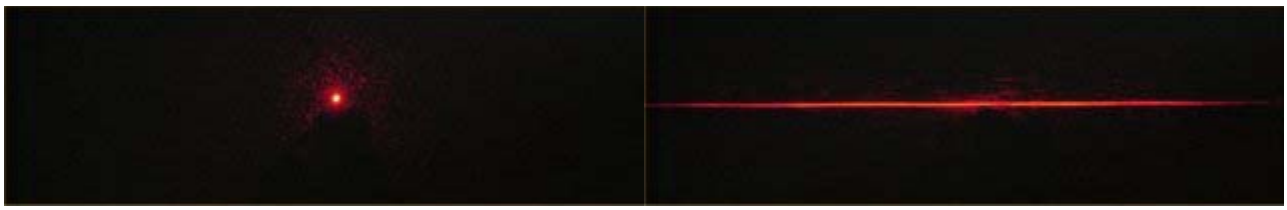
Question #210

This question involves the beam of a laser, expanded into a horizontal line using a cylindrical lens, as shown in the picture at the upper right below. A side view of the apparatus is seen in the photograph at the upper left below.



The picture at the upper right above is a photograph of the apparatus taken from behind the apparatus, showing the laser beam expanded into a horizontal line by the cylindrical lens. The picture at the lower left above and the close-up at the lower right, show the apparatus from the front, looking backwards; you can see the laser, the cylindrical focusing lens in front of the laser, and a heating wire running along the optic axis of the system immediately below the laser beam. The two posts holding the taut wire can be identified by the laser light skimming over them, rendering them visible with a slight red laser glow.

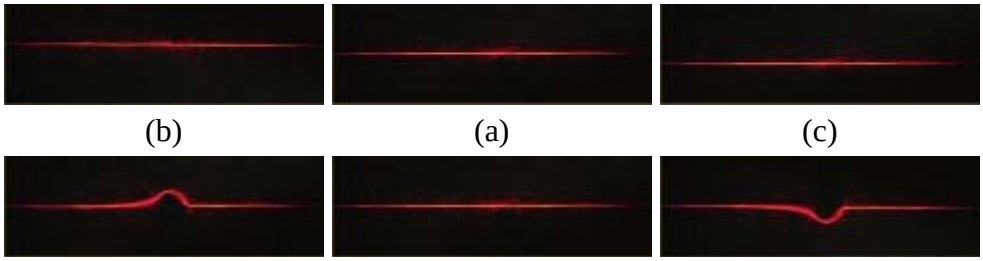


The photographs above show the laser beam striking a screen about ten feet (three meters) in front of the laser without the cylindrical lens, and the laser beam striking the screen after the cylindrical lens (seen mounted on the laser beam exit port) has been inserted.

An electric current is than passed through the wire, having enough magnitude to make the wire very hot to the touch but not red hot to the eye. The question this week involves how this affects the expanded laser beam.

Shown below are the original expanded laser beam (center of both rows of photographs), labelled (a) and four other possible photographs of the laser beam after the wire has been heated by passing a large electrical current, labelled (b), (c), (d), and (e). (The original expanded laser beam is shown for comparison with the possible laser beams affected by the heated wire.) Surveying the possibilities, heating the wire may cause the entire bright line to move higher (b) or to move lower (c), it might cause only a small part of the bright line to move higher (d) or to move lower (e), or it might have no effect, so the line stays the same (a).

The question is what the laser beam will look like after the wire is heated.



(b) (a) (c)

(d) (a) (e)

Which of the above five laser beam photographs most nearly represents how the beam looks after it is expanded by the cylindrical lens AND the wire is heated?

- (a) Photograph (a).
- (b) Photograph (b).
- (c) Photograph (c).
- (d) Photograph (d).
- (e) Photograph (e).

Click here for Answer #210 after February 28, 2005.

Question of the Week

Outreach Index Page

Lecture-Demonstration Home Page

For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.