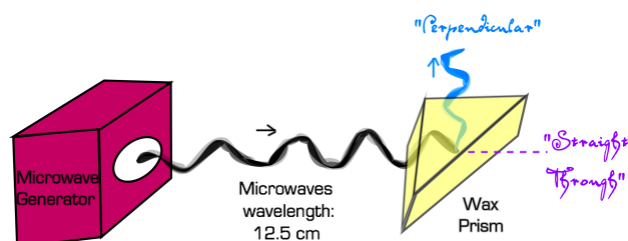


Question #332

A beam of 12.5 cm wavelength microwaves impinges on one of the two right-angle sides of a wax prism, as seen in the figures below. The microwaves enter the prism through the surface, reflect internally from the longer surface, and leave through the other shorter surface at an angle of 90° with respect to their original direction. The microwave source is seen at the left in the photograph at the right of the top row. The receiver is seen in the "perpendicular" position in the photograph at the left of the second row below, and in the "straight through" position in the photograph at the right in the second row below.

Apparatus Schematic



"Perpendicular" position

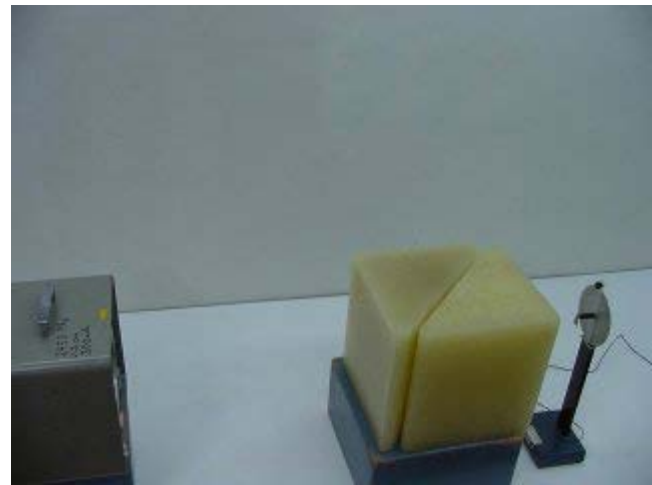


"Straight through" position

A meter, seen in each photograph, indicates the strength of the microwave radiation picked up by the receiver in both positions. Notice that the strength is large in the perpendicular direction, seen in the photograph at the left, due to total internal reflection of the microwaves by the longer side of the right angle prism. The microwave strength along the original axis in the straight through position, seen in the photograph at the right, is nearly zero. Note that the meter used is a zero center meter, so the indicator needle is at the middle of the meter when no waves are present.



Now suppose that a second prism is positioned adjacent to, and at a distance of 1-2 cm from, the first prism, as seen in the photographs above. What will be the strength of the radiation at the points where it was sampled above with the second prism in place as seen in the photographs below? You may select from any of the answers below. You must justify your answers by using physics concepts.



Part 1: The microwave strength at the "perpendicular" position with the second prism in place will be:

- (a) significantly greater than with only the original prism.
- (b) significantly less than with only the original prism.
- (c) about the same as with only the original prism.
- (d) significantly greater than with only the original prism, but negative.
- (e) significantly less than with the original position, but negative.
- (f) about the same as with the original, but negative.

Part 2: The microwave strength at the "straight through" position with the second prism in place will be:

- (a) much greater than with only the original prism.
- (b) a bit greater than with only the original prism.
- (c) much greater than with only the original prism, but negative.
- (d) a bit greater than with only the original prism, but negative.
- (e) about the same as with only the original prism.

Click here for [Answer #332](#) after January 19, 2009.

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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](#).

Apparatus Schematic

