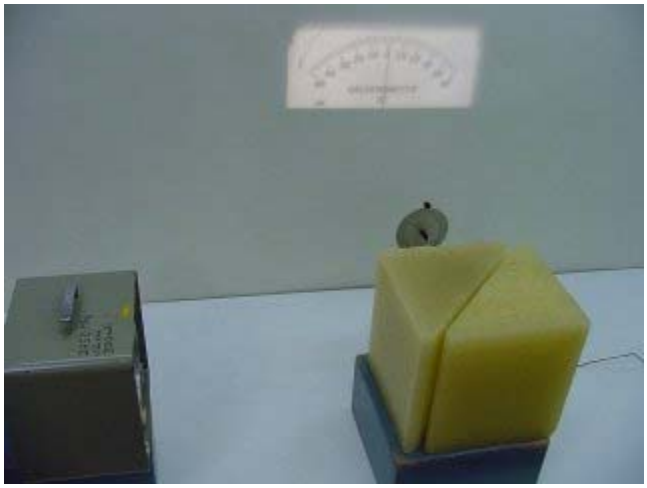
Answer #332

Part 1: The answer (perpendicular case) is (b): significantly less than with only the original prism, as can be seen in the photograph at the left below.

Part 2: The answer (straight through case) is (a): much greater than with only the original prism, as can be seen in the photograph at the right below.



You can see the change in the intensity of the microwavesas the second prism is inserted into the system by clicking your mouse on the photographs.

This is an example of *frustrated total internal reflection*. In the original case, with only one prism, most of the wave reflects internally in the prism, leaving in the upper direction, but an "edge" of the wave, called the *evanescent wave* actually projects out in the straight direction, through the longer edge of the prism. When the second prism is nearby, this wave will continue to progress out of the first prism and into the second prism. It will eventually exit perpendicular to the flat surface of the second prism, after going straight from the source through the two prisms.

The evanescent wave at the exit side of the original prism extends out a significant fraction of a wavelength, so it can be seen when the receiving antenna is close to the exit surface of the prism, as seen in an mpeg video by clicking your mouse on the photograph below.

This demonstration is complicated by the fact that the microwaves actually extend in virtually all directions due to diffraction and interference effects. The actual angular distribution of the microwaves can be seen by moving the receiving antenna around the prisms; you may see this effect by clicking your mouse for the angular distribution with only one prism or for the angular distribution with both prisms. The experiment can also be done with two small glass right angel prisms and a laser, or simply looking at a bright light. With an extended light, you will see a small bright dot where the two prisms make sufficient contact to produce frustrated total internal reflection in the straight through direction and a small black dot in the perpendicular direction.

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