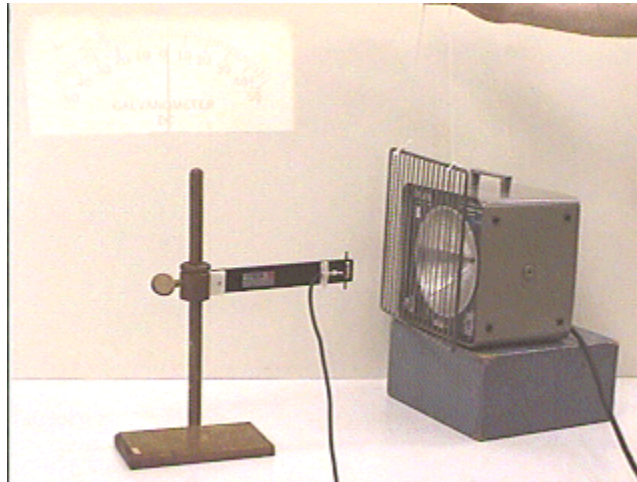


Answer #15

The answer is (b), the intensity of the microwaves will go way down - virtually to zero - when the vertically oriented wires are inserted into the beam. This is seen in the photograph below, where the wire array is positioned immediately in front of the transmitter.

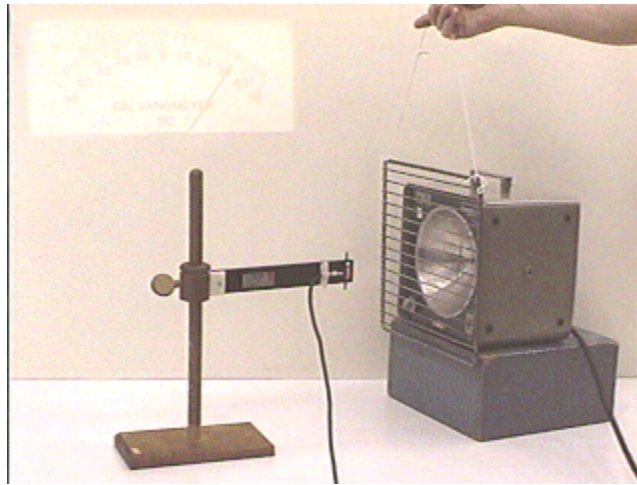


This seems strange behavior - if the microwaves were rope waves they would pass between the wires with virtually no effect.

What happens in the case of microwaves is that the vertically polarized microwaves are absorbed by the vertical wires, causing electrons in the wires to oscillate along the wires. As the electrons oscillate, the wires act as antennas, re-emitting the microwaves. However, the re-emission is in all directions, so the radiation that is initially directed from the transmitter toward the receiver by the parabolic reflector is now spreading out in all directions, and therefore strongly attenuated at the position of the receiving antenna.

This is in fact the way that polaroid works for light. Iodide crystals aligned in parallel rows absorb light that is polarized along the axis of the crystal. However, the iodide crystals have much more resistivity, and absorb the energy rather than re-emitting it.

Referring to our original microwave experiment, what would happen if the wire rack were inserted with its axis perpendicular to that of the polarization of the microwaves? The photograph below shows that this has almost no effect on the microwave beam.



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