

Frequently asked questions QUANTUM ELECTRONICS
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Module 1: Frequently asked questions:

1. Q: Does diffraction always lead to increase in beam width?
2. Q: In the case of uniaxial media along which directions of propagation will the \vec{S} and \vec{k} be along the same direction
3. Q: Is Snell's law valid when light enters an anisotropic medium from an isotropic medium?

Answers of module 1 FAQs:

A 1 : No, it depends on the phase front. If the phase front is plane or curved and diverging, then the beam width will increase; on the other hand if the phase front is curved but converging, then the beam width will decrease first and then after reaching a minimum width, the beam will expand.

A2: A: In the case of uniaxial media when the direction of propagation coincides with the principal axes or if the direction is along the x - y plane, then the \vec{S} and \vec{k} will be parallel to each other.

A3: Yes, Snell's law is valid even in this situation provided we interpret Snell's law in terms of continuity of tangential components of the \vec{k} of the incident and refracted waves. Thus if the incident wave is normal to the interface between an isotropic and an anisotropic medium, the \vec{k} of the refracted wave for both the ordinary and the extraordinary waves will be normal to the interface. However since for the extraordinary wave, in general \vec{S} , and \vec{k} are not parallel to each other, the direction of \vec{S} of the refracted extraordinary ray may not be normal to the interface.