

1. Two plane waves of the same wavelength λ are propagating along the directions of wave vectors $\mathbf{k}_1, \mathbf{k}_2$ as shown in the figure below.
 - 1.a) Describe the interference pattern that would be observed on the plane xy .
 - 1.b) Describe the interference pattern that would be observed on a plane parallel to xy but one wavelength λ away towards the positive z direction.
 - 1.c) Describe the interference pattern that would be observed on the plane yz .

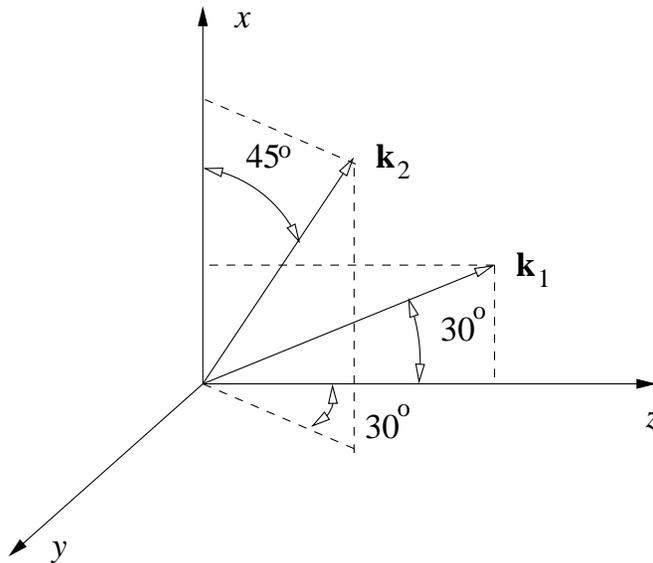


Figure A

2. A plane wave and a spherical wave, both of the same wavelength, are co-propagating as shown in figure B on the next page.
 - 2.a) Describe the interference pattern that would be observed on a plane perpendicular to the z axis at a distance of 1000λ away from the origin of the spherical wave.
 - 2.b) Repeat for the plane located 2000λ away from the origin of the spherical wave.
 - 2.c) What do you observe? Explain in physical terms.

- 2.d) What is the relationship between your result and a Michelson interferometer with a lens inserted in one of the two arms?

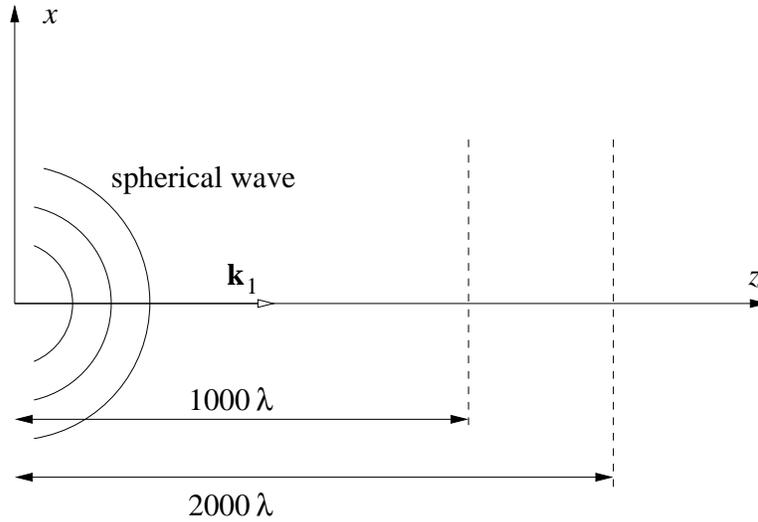


Figure B

3. Repeat the calculations of the previous problem for the case when the plane wave is propagating off-axis as shown in Figure C below. Explain the differences that you observe.

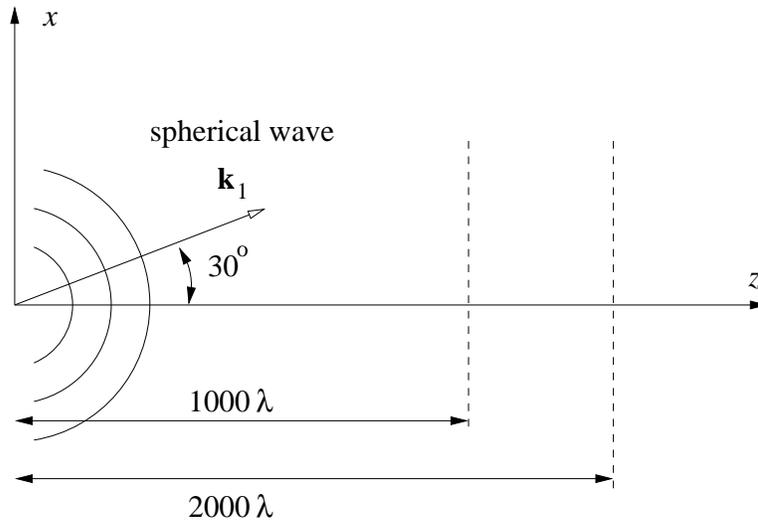


Figure C

4. A “fan” of N plane waves are propagating symmetrically with respect to the z axis, as shown in figure D below. The angular spacing between successive members of the fan is fixed and equal to $\Delta\theta$. Describe the interference pattern observed on a plane perpendicular to the z axis.

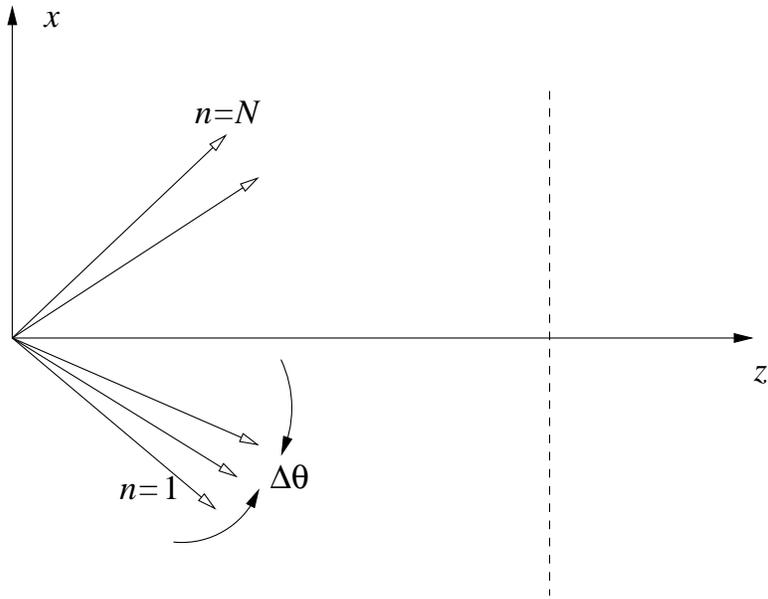


Figure D

5. Describe the interference pattern between two counter-propagating plane waves. This is also known as a “standing wave.” Explain why.

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2.71 / 2.710 Optics
Spring 2009

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