Difraction

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Diffraction

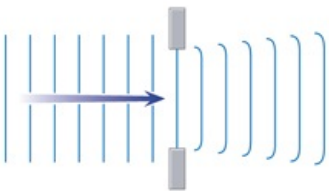
[1]

Introduction

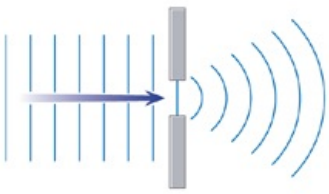
Diffraction is the phenomenon that occurs when waves bend around objects; specifically when passing through a gap and spreading out at the end. Francesco Maria Grimaldi an Italian scientist was the first to observe and identify this phenomenon.

Diffraction in Light

Light diffraction refers to the spreading of light that occurs when a beam of light interacts with an object. Based on the object type and the specific details, diffracted light is perceived in different ways. An example of this is when a light beam is aimed at the object edge, the light appears to bend around the object. This demonstrates that light shows wavelike properties. Diffraction does not change the wavelength as when light is made up of only one colour (monochromatic) when the bends it will produce the same colour, red light is diffracted more than violet light showing that diffraction rises with wavelength. Therefore, the pattern observed when using white light will contain bands (fringes) containing the spectrum of colours from red to violet. The amount it diffracts depends on the size of the wavelength of light passing through and the size of the gap its passing through. [2]



When waves diffract through a big gap they don’t spread out much as the light wavelength is much smaller than the gap size.



Diffraction in Microscopes

[3]

The wavelength of light passing through also effects the amount of diffraction. A shorter wavelength gives less diffraction, this is significant for microscopes as diffraction causes image details to blur.The electrons in an electron microscope have a small wavelength and this can resolve more fine details as compared to light microscopes. This means we can improve resolution by using a different wavelength however we cannot eliminate diffraction because it is a natural result of the wave nature of light.

Lens

When a lens forms an image of a point object the image is actually a miniature diffraction pattern. For a lens or any circular hole, the image of a point object will be made up of a circular central peak (called the diffraction spot) surrounded by faint circular fringes. If two point objects are quite close together, the image of the diffracted patterns would overlap. Moving the objects even closer together results in an inability to make out whether there is a single image or their are two images overlapping.

Diffraction in Ophthalmology

Diffraction in optics is an interaction between the light and the circular pupil. The reason the image degrades and thus impairs perfect imagery is diffraction. The diffracted image of a point image is called an Airy disk which forms on the retina. The size of the pupil is important and is a concern in diseases like Glaucoma where patients are taking Miotics (Drugs which constrict Pupil) which cause more diffraction.

Links

Bibliography

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References

1. http://en.wikipedia.org/wiki/Diffraction
2. http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/home_energy/introduction_to_wavesrev6.shtml
3. http://www.antonine-education.com/Pages/Physics_2/Waves/WAV_08/Waves_8.htm