

1: Scalar Diffraction from a Circular Aperture : Charles J. Daly :

Scalar diffraction from a circular aperture is a ubiquitous problem that arises in a variety of disciplines, such as optics (lenses), acoustics (speakers), electromagnetics (dish antennas), and ultrasonics (piston transducers).

Examples[edit] Circular waves generated by diffraction from the narrow entrance of a flooded coastal quarry Solar glory at the steam from hot springs. A glory is an optical phenomenon produced by light backscattered a combination of diffraction, reflection and refraction towards its source by a cloud of uniformly sized water droplets. The effects of diffraction are often seen in everyday life. The most striking examples of diffraction are those that involve light; for example, the closely spaced tracks on a CD or DVD act as a diffraction grating to form the familiar rainbow pattern seen when looking at a disc. This principle can be extended to engineer a grating with a structure such that it will produce any diffraction pattern desired; the hologram on a credit card is an example. Diffraction in the atmosphere by small particles can cause a bright ring to be visible around a bright light source like the sun or the moon. A shadow of a solid object, using light from a compact source, shows small fringes near its edges. The speckle pattern which is observed when laser light falls on an optically rough surface is also a diffraction phenomenon. When deli meat appears to be iridescent , that is diffraction off the meat fibers. Diffraction can occur with any kind of wave. Ocean waves diffract around jetties and other obstacles. Sound waves can diffract around objects, which is why one can still hear someone calling even when hiding behind a tree. James Gregory " observed the diffraction patterns caused by a bird feather, which was effectively the first diffraction grating to be discovered. Mechanism[edit] Photograph of single-slit diffraction in a circular ripple tank In traditional classical physics diffraction arises because of the way in which waves propagate; this is described by the Huygens-Fresnel principle and the principle of superposition of waves. The propagation of a wave can be visualized by considering every particle of the transmitted medium on a wavefront as a point source for a secondary spherical wave. The wave displacement at any subsequent point is the sum of these secondary waves. When waves are added together, their sum is determined by the relative phases as well as the amplitudes of the individual waves so that the summed amplitude of the waves can have any value between zero and the sum of the individual amplitudes. Hence, diffraction patterns usually have a series of maxima and minima. In the modern quantum mechanical understanding of light propagation through a slit or slits every photon has what is known as a wavefunction which describes its path from the emitter through the slit to the screen. The wavefunction the path the photon will take is determined by the physical surroundings such as slit geometry, screen distance and initial conditions when the photon is created. In important experiments A low-intensity double-slit experiment was first performed by G. In the quantum approach the diffraction pattern is created by the distribution of paths, the observation of light and dark bands is the presence or absence of photons in these areas no interference! The quantum approach has some striking similarities to the Huygens-Fresnel principle , in that principle the light becomes a series of individually distributed light sources across the slit which is similar to the limited number of paths or wave functions available for the photons to travel through the slit. There are various analytical models which allow the diffracted field to be calculated, including the Kirchhoff-Fresnel diffraction equation which is derived from wave equation , the Fraunhofer diffraction approximation of the Kirchhoff equation which applies to the far field and the Fresnel diffraction approximation which applies to the near field. Most configurations cannot be solved analytically, but can yield numerical solutions through finite element and boundary element methods. It is possible to obtain a qualitative understanding of many diffraction phenomena by considering how the relative phases of the individual secondary wave sources vary, and in particular, the conditions in which the phase difference equals half a cycle in which case waves will cancel one another out. The simplest descriptions of diffraction are those in which the situation can be reduced to a two-dimensional problem. For water waves, this is already the case; water waves propagate only on the surface of the water. For light, we can often neglect one direction if the diffracting object extends in that direction over a distance far greater than the wavelength. In the case of light shining through small circular holes we will have to take into account the full three-dimensional nature of the problem. Diffraction of light[

edit].

2: OSA | Scalar beam diffraction by a wide circular aperture

involving scalar diffraction from a circular aperture. Thus, mathematicians, scientists, and engineers working in optics, astronomy, acoustics, antenna design, biomedical engineering, and non-

3: Fresnel diffraction - Wikipedia

The scalar wave theory is used to evaluate the expected diffraction patterns from a circular aperture. The standard far-field Kirchhoff approximation is compared to the exact result expressed in terms of oblate spheroidal harmonics.

4: Full text of "Diffraction of scalar waves by a circular aperture"

Here scalar diffraction by a beam normally incident upon a circular aperture is analyzed, a situation involving shadow boundaries, multiple diffraction, and an axial caustic. The result is a simple and accurate uniform solution that satisfies the boundary conditions in the aperture plane.

5: Diffraction of Scalar Waves by a Circular Aperture II

Abstract. The scalar wave theory is used to evaluate the expected diffraction patterns from a circular aperture. The standard far-field Kirchhoff approximation is compared to the exact result expressed in terms of oblate spheroidal harmonics.

6: Diffraction - Wikipedia

includes (i) Diffraction at a circular aperture, annulus or disk of a divergent spherical incident wave, wherein the source point, the axis 'of the diffracting object, and.

7: Scalar wave diffraction from a circular aperture - Digital Library

Numerical calculation of near field scalar diffraction using angular spectrum of plane waves theory and FFT field for a circular aperture and a spiral slit are.

Parcels for Inspector West Broun, H. Artist unknown. The Oecd Jobs Study Environmental fate modelling of pesticides Blackduck James F. Kay Measurement in todays schools Social markets: five stipulations Helping resolve conflict Up at the Riverside (Ted Smalley) What in the world is He waiting for? Absalom, Absalom Jan Mark Paths of glory Books for second graders Doctor Kit (Booktivity) Proceed to judgement India : the divine dance of life and death EGLR 2007, Volume 1 Extrusion coating a process manual Tierck Clafsen DeWitt and Descendants of His Son Luycas DeWitt Africa, Latin America, and the East Launching the new republic, 1789-1800 A Zora Neale Hurston Reader The unfinished job justification of the Holocaust West Mexican art and modernist artists Barbara Braun. V. 5. Eternity God Chaucers language and versification. State of decay game guide Structural composites Professional networking Endovascular treatment of anterior circulation aneurysms Reza Jahan, Gary Duckwiler, and Fernando Vinuela The South African Ostrich Cook Book Complete and Easy Guide to Social Security and Medicare, 1989 Flirting with scandal chanel cleeton The working class in Weimar Germany Bounty on a Lawman (Bounty Hunter) Human digestive system in telugu Persuasion and Rhetoric Fabulation or the re-education of undine Incorporate in Nevada from Any State, 2E (Legal Survival Guides) Dungeon master 4th edition for dummies