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Fourier transforms of geometric forms and interference patterns, deflection of light by the sun

DO Tan Si
HoChiMinh-city Physical Association, Vietnam

Consider an object defined by a function $f(\vec{r})$ equal to unity for a point $\vec{r}$ inside a domain D and to zero for a point outside. Consider the diffraction of a plane wave $\exp i(\vec{k}_0\vec{r}-\omega t)$ by this object. The diffracted wave may be described by the function $f(\vec{r})\exp i(\vec{k}_0\vec{r}-\omega t)$. The probability for finding a plane wave $\exp i(\vec{k}\vec{r}-\omega t)$ in the diffracted wave is proportional to the square of the integral over the whole space of $\exp(-i\vec{k}\vec{r})\, f(\vec{r})\exp i\vec{k}_0\vec{r}$, i.e., the Fourier transform of $f(\vec{r})$ calculated for $\Delta\vec{k}=\vec{k}-\vec{k}_0$. The problem of calculating the amplitude of diffraction and interference patterns is thus reduced to that of calculating the Fourier transforms of geometric forms. The aim of this work is to popularize the method for performing these calculations which is based on the properties of the Dirac delta and the Heaviside functions, the reciprocal vectors as explained in the previous work "On amplitude of Fraunhofer diffraction of waves by 3D objects". Results of calculations for the cases of a point, an array of points, an array of stripes, discs, array of spheres and ellipsoids, cones, cylinders, intersections of them are given, completing the results obtained in the previous work. An attempt to calculate the angles of deflection of light by the form of the sun is also done and perhaps shows that the deflection given by General relativity is the sum of those by the form and the mass of the sun?

Biography

DO Tan Si has completed his PhD in 1971 and is a Researcher at the Université Libre de Bruxelles and the Universíté de l'Etat à Mons (Belgium); Lecturer at the HoChiMinh-city Natural Sciences University (Vietnam) and is now retired. He researches on mathematics and concentrates on the differential transforms including almost the Fourier transform; on differential calculus for resolving differential equations, linking special functions with monomials, modernizing the Laplace transform and, in physics, is author of the paper "*On amplitude of Fraunhofer diffraction of waves by 3D objects*".

tansi_do@yahoo.com

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