

EDUCATIONAL SOFTWARE PACKAGE FOR ELECTRO-
MAGNETIC SCATTERING FROM SIMPLE TWO AND
THREE DIMENSIONAL OBJECTS

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In electromagnetics education, the fundamentals of electromagnetic scattering theory are usually taught through solutions of scattering from canonical objects due to excitation by incident plane, cylindrical, or spherical waves. These solutions are in general available in closed mathematical forms that in many cases are hard to visualize and difficult to extract from them the physical characteristics of the scattering process. Therefore, it is important to have such canonical solutions programmed and arranged in an easy to use tool for the purpose of visualizing the physical phenomena of scattering from these scattering objects. Furthermore, such tools can be used as benchmarks for a wide range of researchers who are developing numerical electromagnetic techniques. Thus, the availability of programs that solve these types of canonical problems on the widely available personal computers and workstations provides students with a better understanding of electromagnetic scattering theories. Furthermore, researchers would be able to have immediate access to verification solutions to a variety of test cases. With this need in mind, a software package has been developed to compute and display the scattering from two and three-dimensional canonical objects based on exact boundary value solutions. In addition to canonical objects this developed package also includes simple non-canonical objects where the presented scattering parameters are based on simple approximations. Many objects are considered in this package such as, thin strip, circular cylinder, capped wedge, triangular and circular flat plates, sphere, and ellipsoid. The package is constructed to provide solutions for both dielectric and conductive materials whenever appropriate. It calculates the far and near field components due to excitation from a line source or a plane wave. In the two-dimensional problems the TE and TM cases are treated separately. Electromagnetic analysis software packages are judged not only by their computational efficiency and adaptability, but also by their ease of use and the friendliness of their user interfaces. Graphical user interface is developed for each object considered in order to supply the object parameters and excitation type and parameters and to display the computed near and/or far field results and any other appropriate parameters. Since the computations are considerably fast, the user interface is organized such that the user can interactively observe, in near real time, the effect of changing any of the physical or electrical parameters on the resulting far field patterns and parameters.

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