
On the scattering of electromagnetic waves by fractal screens: a Rayleigh-Sommerfeld approach

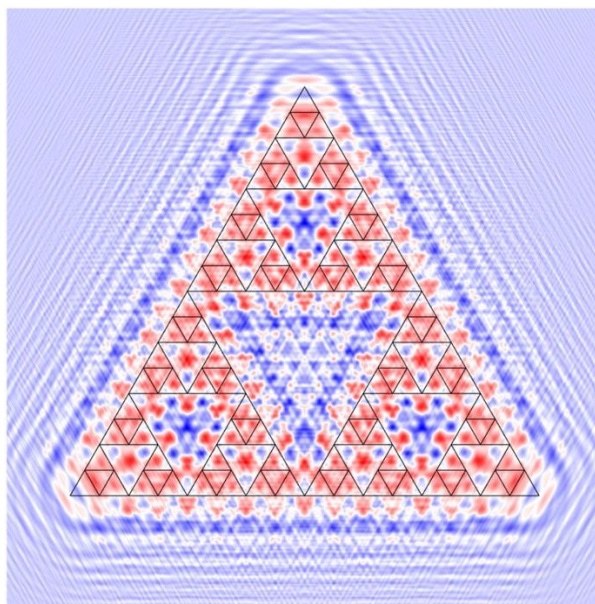
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Wednesday 27th March 2019 at 6.00pm
(Refreshments at 5.45pm)

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Abstract

The scattering of plane waves by complex domains (self-similar or fractal obstructions characterized by roughness across many scales) is a problem of fundamental interest for physicists and applied mathematicians. In laser optics experiments, for instance, descriptions of light fields after they have interacted with a fractal screen are typically based on the well-known Fresnel diffraction equation or, more commonly, Fourier transforms and the Fraunhofer (far-field) limit. These simplified models can work well in some fairly restrictive parameter regimes, but they are not always entirely satisfactory. Here, we develop a more general formulation for scattering problems based on the Helmholtz equation and Rayleigh-Sommerfeld integrals. Such an approach, in conjunction with the Kirchhoff approximation and specifying boundary conditions, can be computationally expensive but it is free from many of the physical limitations inherent to more traditional methods. A range of complex domains will be considered, including preliminary results for screens based on the classic fractal shapes of Cantor (sets and dusts) and Sierpinski (carpets and triangles).



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No charge is made to attend meetings. Non-IMA members are welcome.