Waves in complex media: hypercomplex approach

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The theory of wave propagation in complex media, that include all kind of media which are not homogeneous and isotropic, is one of the main and rapidly developing areas of modern mathematical physics with applications which go from electrical engineering to astrophysics. The aim of the present talk is to give a brief overview of some of the new and efficient techniques based on quaternionic analysis for the analytic and numerical study of electromagnetic propagation problems in inhomogeneous and chiral media as well as of relativistic quantum models corresponding to the Casimir effect and other boundary value problems of particle theory.