

GAUSSIAN BEAM MODELS - THEIR ROLE IN UNDERWATER ACOUSTICS

Paul Hursky and Michael B. Porter

Heat, Light, and Sound Research Inc, La Jolla, USA

Low-frequency acoustic wave propagation modeling for many underwater acoustics applications is a successful and mature technology using narrowband models based on normal mode, wavenumber integration and parabolic equation models. However, the demands of the applications are significantly more modest than, say, in 3D seismic modeling of anisotropic media. We will quickly review the traditional mainstream repertoire of the underwater acoustic modeler and what the role of ray tracing and Gaussian beam modeling has been. In particular, we will discuss a variant of the original Gaussian beam formulation that has proven to be very useful in this field. We will then outline applications of recent interest that challenge the capabilities of existing models, but which Gaussian beams are especially well-suited for. To show how we are addressing some of these new challenges, we will discuss some of our recent work. One example is modeling of high-frequency propagation for acoustic communications, in order to recover the broadband impulse response function of the ocean "channel", where the time-evolving ocean surface produces Doppler shifts along surface-interacting paths. If time permits, we will also discuss the emerging interest in 3D modeling of internal waves and bathymetric canyons and seamounts.