

1. Record Nr.	UNINA9910254290103321
Titolo	Modern Solvers for Helmholtz Problems // edited by Domenico Lahaye, Jok Tang, Kees Vuik
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Birkhäuser, , 2017
Edizione	[1st ed. 2017.]
Descrizione fisica	1 online resource (XII, 243 p. 54 illus., 39 illus. in color.)
Collana	Geosystems Mathematics, , 2510-1544
Disciplina	530.124
Soggetti	Numerical analysis Partial differential equations Matrix theory Algebra Difference equations Functional equations Numerical Analysis Partial Differential Equations Linear and Multilinear Algebras, Matrix Theory Difference and Functional Equations
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references at the end of each chapters.
Nota di contenuto	I Algorithms: new developments and analysis -- II Algorithms: practical methods and implementations -- III Industrial applications. .
Sommario/riassunto	This edited volume offers a state of the art overview of fast and robust solvers for the Helmholtz equation. The book consists of three parts: new developments and analysis in Helmholtz solvers, practical methods and implementations of Helmholtz solvers, and industrial applications. The Helmholtz equation appears in a wide range of science and engineering disciplines in which wave propagation is modeled. Examples are: seismic inversion, ultrasonic medical imaging, sonar detection of submarines, waves in harbours and many more. The partial differential equation looks simple but is hard to solve. In order to approximate the solution of the problem numerical methods are needed. First a discretization is done. Various methods can be used:

(high order) Finite Difference Method, Finite Element Method, Discontinuous Galerkin Method and Boundary Element Method. The resulting linear system is large, where the size of the problem increases with increasing frequency. Due to higher frequencies the seismic images need to be more detailed and, therefore, lead to numerical problems of a larger scale. To solve these three dimensional problems fast and robust, iterative solvers are required. However for standard iterative methods the number of iterations to solve the system becomes too large. For these reason a number of new methods are developed to overcome this hurdle. The book is meant for researchers both from academia and industry and graduate students. A prerequisite is knowledge on partial differential equations and numerical linear algebra.
