

# FastBEM Acoustics®

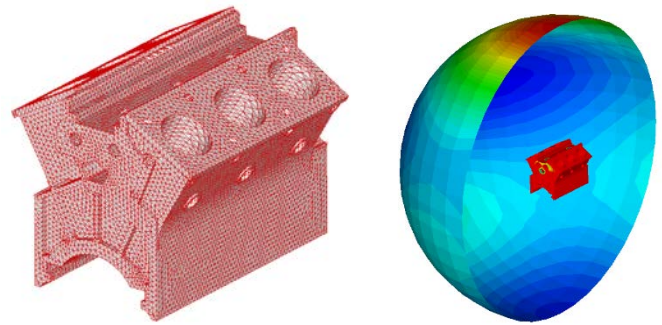
**Fast, Accurate, Easy to Use, and Cost Effective!**

Version 8.0, Released January 11, 2025

Free Download at [www.fastbem.com](http://www.fastbem.com)

## Features

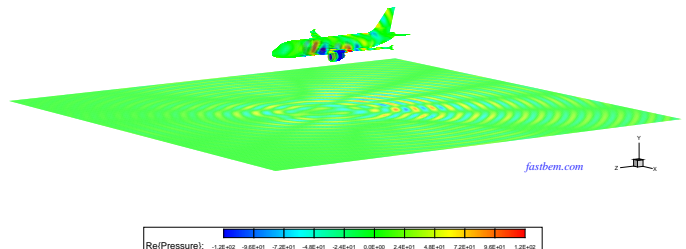
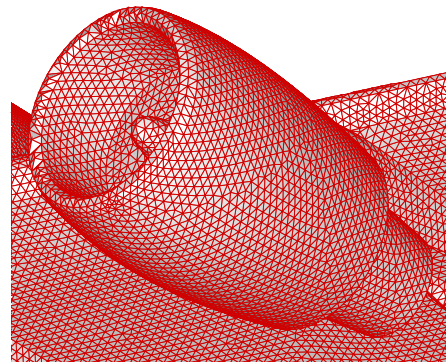
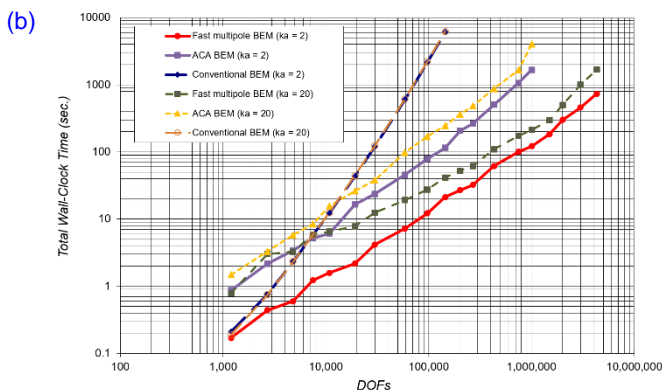
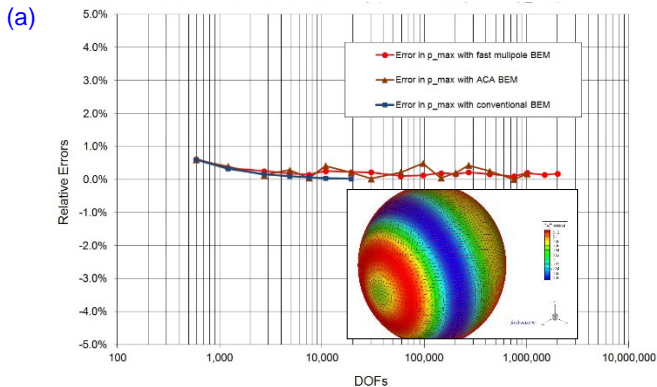
- Advanced acoustic simulation software based on the fast multipole (FMM), adaptive cross approximation (ACA) and fast direct boundary element method (BEM)
- Solve large-scale acoustic BEM models with millions of boundary elements on a desktop PC
- Fast, efficient and cost-effective BEM solvers
- Full-space and half-space/symmetry problems in 3-D exterior or interior domains
- Radiation and scattering problems at single or multiple frequencies
- $O(N)$  efficiency in solution and memory storage ( $N$  = number of degrees of freedom or DOFs)
- Developed by leading experts on the BEM and fast solution methods



**Sound pressure radiated from an engine block**  
(132,764 elements,  $ka = 3.6$  or  $f = 546$  Hz, solved in 2 min. \*)

## Applications

- Computational acoustics for aerospace, defense, automotive, machinery and other industries
- Noise predictions in electronics, telecommunication devices and other consumer products
- Environmental noise evaluation, room acoustics
- Acoustics for audio equipment, biomedical acoustics
- Underwater acoustics



**A radiating sphere with the total number of boundary elements up to 4.3 million**

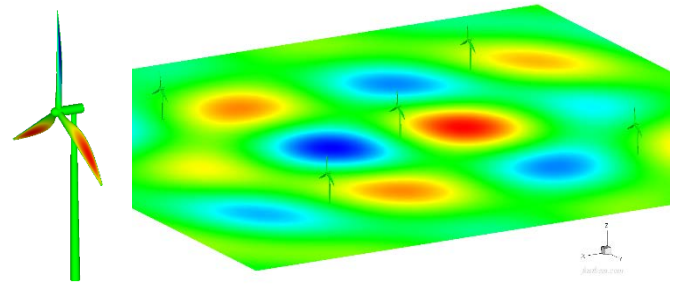
(a) Relative errors (at  $ka = 2$ ), and (b) Wall-clock time (on a laptop PC \*)

**Computed sound pressure on the ground radiated from a landing Airbus A320 airplane**

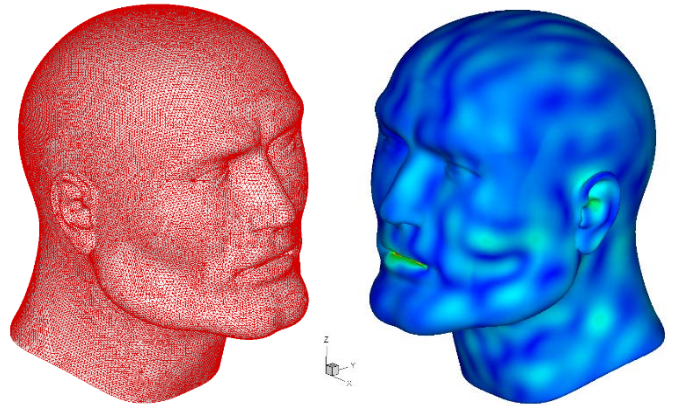
(539,722 elements,  $ka = 61.5$  or  $f = 90$  Hz, solved in 25 min. \*)

## Technical Highlights

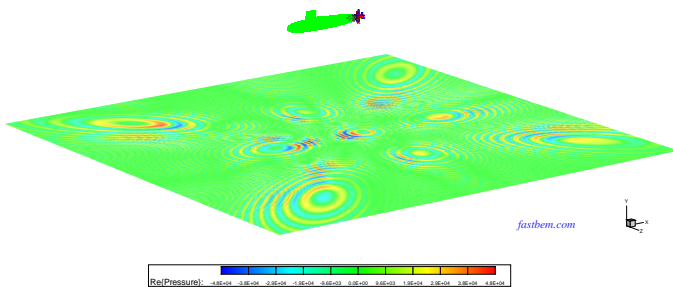
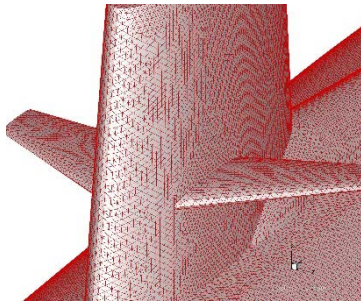
- Parallel solvers based on the fast multipole (FMM), adaptive cross approximation (ACA), fast direct BEM, and high-frequency BEM (HFBEM)
- Dual boundary integral equation (BIE) formulation, free from the fictitious eigenfrequencies and well-conditioned for thin shapes
- Simple input data structure, easy to integrate with in-house codes and other commercial CAE software
- Boundary conditions (BCs) include: pressure, particle velocity, and impedance BCs
- Acoustic sources include: multiple plane incident waves, reverberant conditions, monopole and dipole sources, or any other user-defined sources
- Output results: pressure, particle velocity, sound pressure level (SPL), sound intensity level (SIL) on both structure and field surfaces, total sound power and sound power level; acoustic transfer matrix/vector; acoustic panel contribution factors
- Interfacing with ANSYS® and NASTRAN for building and importing the BEM models
- Java® based GUI for pre- and post-processing
- Output to Tecplot® for fast post-processing and visualization of the BEM models and results
- Animation of the BEM results in the time-domain
- Windows® and Linux OS (both 64-bit)
- Customized versions can be arranged



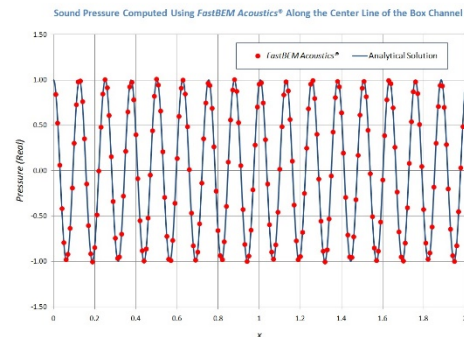
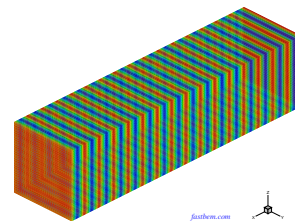
**Noise field radiated from five wind turbines**  
(557,470 elements,  $ka = 5$ , solved in 4 min. \*)



**Computed acoustic pressure on a human head model**  
(87,340 elements,  $ka = 50$  or  $f = 11$  kHz, solved in 1 min. \*)



**A Skipjack submarine model and the computed sound field on the sea floor radiated from the submarine**  
(250,220 elements,  $ka = 383.7$  or  $f = 1233$  Hz, solved in 7 min. \*)



**Sound pressure inside a box channel**  
(51,600 elements,  $ka = 100$  or  $f = 2730$  Hz, solved with ACA solver option in 11 min. \*)

\* Note: All the BEM models presented here are solved on a laptop PC with Intel® Core i7-13800H CPU and Windows® 11 64-bit OS; Tolerance for convergence for FMM and ACA solvers is set at  $1 \times 10^{-4}$ ; and  $ka$  is the non-dimensional wavenumber for the models.

## For More Information

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