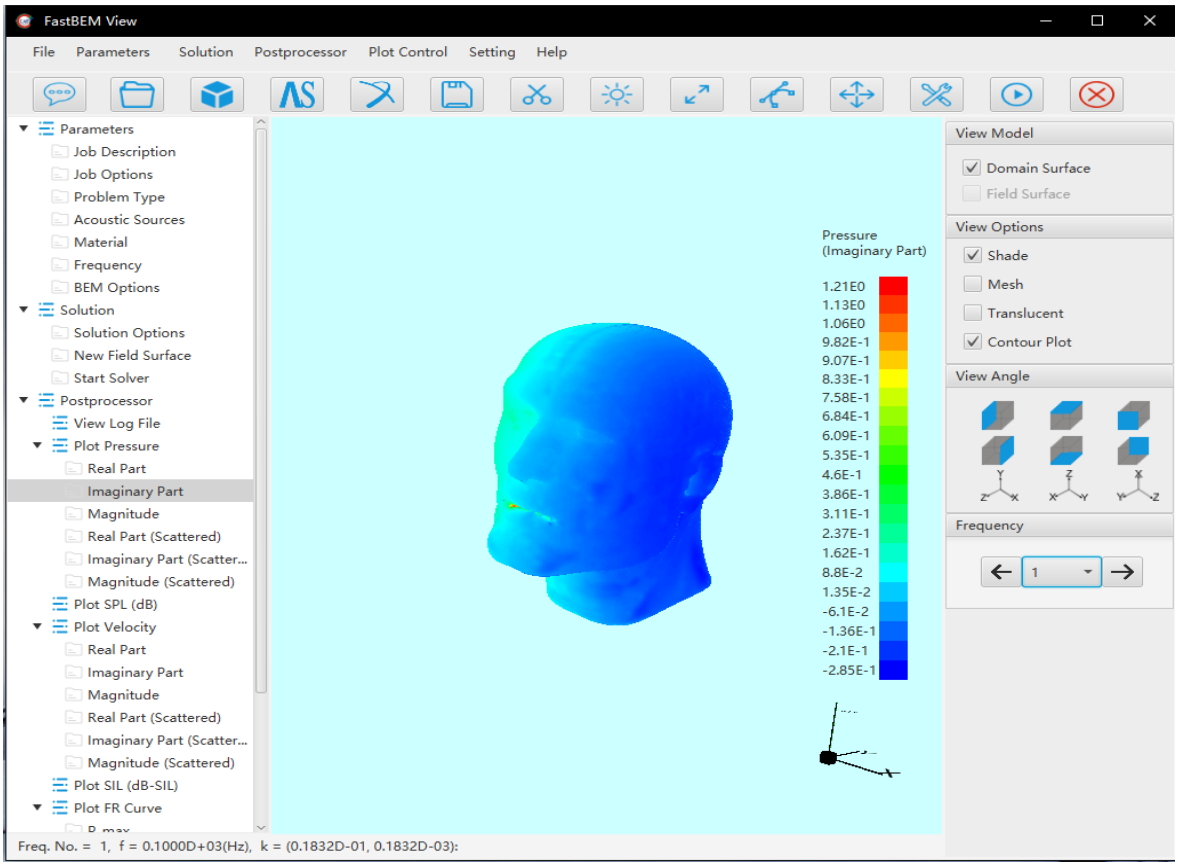
FastBEM View® Guide

Quick Start and Tutorial



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1. Quick Start

FastBEM View® is the graphical-user interface (GUI) for the acoustic analysis solver program ***FastBEM Acoustics***®. Currently, this GUI is only available for the Windows® platform. This guide shows how to launch and use this GUI to view the model, launch the solver program, and view the results. If you want to learn more about the solver program ***FastBEM Acoustics***®, please download and read the ***FastBEM Acoustics***® *User Guide* (available at www.fastbem.com/downlaod.html).

1.1 Installation

First, download the entire package (including the solver program and the GUI) from the website www.fastbem.com/downlaod.html. Then, simply double click the installation program and follow the instructions on the screen.

An evaluation license comes with the package. If you purchased a full license, install the license file as instructed in the e-mail from the support team.

1.2 Launch the GUI Program

To run the GUI program ***FastBEM View***® under Windows® 7, simply click:

Start ⇒ **All Programs** ⇒ **FastBEM Acoustics** ⇒ **FastBEM View**

Under Windows® 8/8.1/10, click the **FastBEM View** icon on the Start screen.

Several sample input model files are available in the following installation folder:

C:\Program Files\FastBEM\FastBEM Acoustics\samples\input_files

The installation folder path may be different, if you have chosen to install the program in a different location.

2. Using the GUI

The graphical-user interface ***FastBEM View***® can be used to view the BEM model, check or change the parameters to be used in the solution, select a different field surface, launch the ***FastBEM Acoustics***® solver, and view the results.

A snapshot of the ***FastBEM View***® GUI is shown in Figure 2.1.

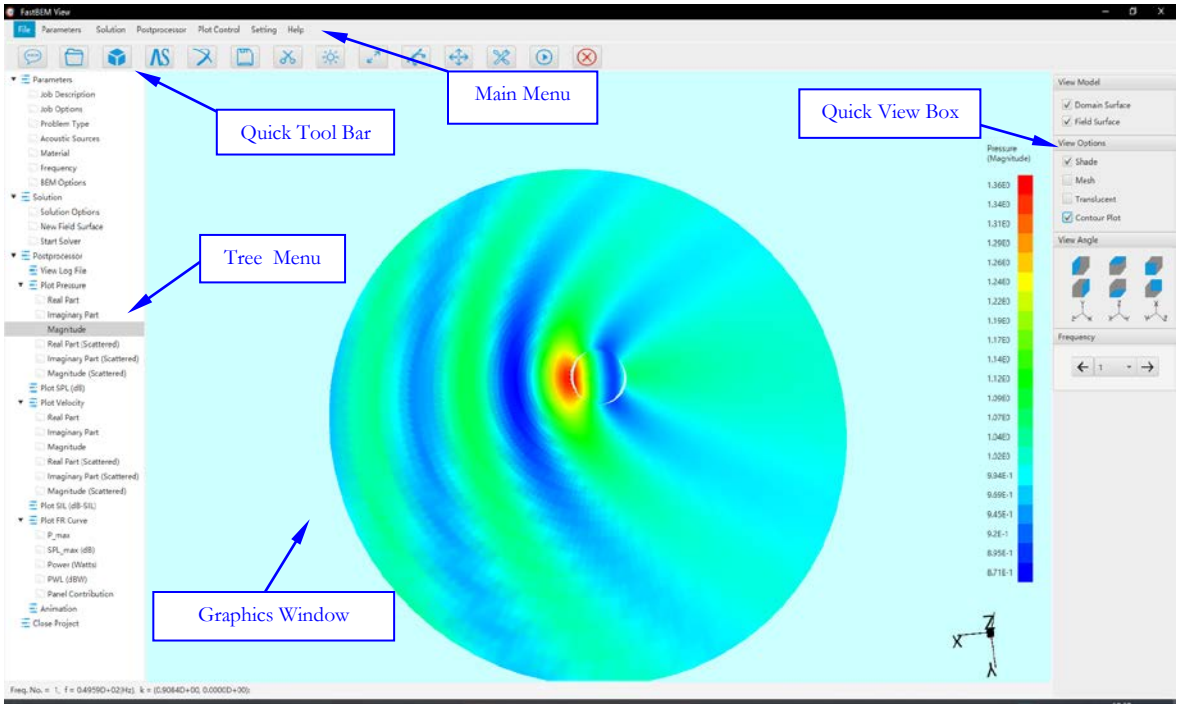


Figure 2.1. A snapshot of the graphical-user interface ***FastBEM View***®.

The GUI manages the BEM analysis jobs using projects. The project name (without the extension *.project*) is also used as the name of the folder where all the input (*input.dat* and *input.fmm*) and output files, as well as the project file, are stored.

Sample project files (**.project*) are available from the installation folder under the folder **samples/project_files**. To test these sample project files, copy them from the installation folder to your folder and open them in ***FastBEM View***®.

The functions of the menus in the GUI ***FastBEM View***® are as follows. In the top main menu, the **File** menu contains the following commands:

File/New Project	Start a new project. Select the location and give a name of your project (without providing the extension *.project*).
File/Open Project	Open an existing project. Select a project file with the file extension *.project*.
File/Read Data	Read in the BEM data from a model file in the format of the *input.dat* file (see Chapter 1).
File/Import Model	Import models using ANSYS® archive or Nastran bulk data files (see Chapter 4).
File/Save Project	Save all the input/output files for the current project.
File/Save Project As	Save the current project with a new name.
File/Print	Select an area on the graphics window and print the image.
File/Close Project	Close the current project.
File/Exit	Exit the GUI program.

The **Parameters** menu, which is also placed on the top of the tree menu on the left panel, is used to specify or modify the parameters to be used for the BEM model. See Chapter 1 on the definitions of these parameters. This menu includes the following commands:

Job Description	One line to give a brief description of the job.
Job Option	Specify the *Job Type* as either *Complete* or *Field Only*. If the latter is the case, the saved result file *output_result_saved.dat* also need to be available and selected (Users can copy the results in the file *output_result.dat* to the file *output_result_saved.dat* outside the GUI, before selecting the *Field Only* option). Specify the *Solver Type* as either *Fast Multipole BEM*, *ACA BEM* or *Conventional BEM*. The fast multipole BEM is the default and preferred solver due to its efficiencies in solving large-scale BEM models.
Problem Type	Specify the model as either *Full* space or *Half* space/symmetry model. If the latter is the case, the orientation and property of the half-space/symmetry plane also need to be specified.
Acoustic Sources	Specify the numbers and properties of any plane incident waves, point (monopole or dipole) sources, and if or not user-defined acoustic sources (other than the plane incident waves and point sources) will be provided using an input file (the *input.inc* file). For specifying the plane incident waves or point sources, enter the number of plane waves or point sources on the related tab and press the icon  to refresh. A table for entering the amplitudes and direction or location vectors of the plane waves or point sources, respectively, will appear.
Material	Specify the acoustic material constants for the medium.
Frequency	Specify the frequency range and number of frequencies for the analysis, if or not the 1/*N*th-octave band should be use, and if or

not the BCs should be updated at each frequency from an input file (the *input.jbc* file).

BEM Options Specify if or not the dual BIE should be applied, integration rules on the boundary and on the field surface, if or not to use animation, and the result save option to be used with Tecplot®.

In the **Solution** menu, which is also available in the tree menu, the following commands or submenus are listed:

Solution Options Verify or modify the parameters in the *input.fmm* file to be used for the iterative solver. When the BEM model file is read in for the first time, the parameters in the *input.fmm* file in the installation folder under **samples/input_files** are also read in as the default values for the entries in the **Solution Options** menu.

New Field Surface Define a new field surface from a few pre-defined selections, that is, a rectangle, a circle, an open cube (a box with one side removed), a hemisphere, or an open cylinder. These new field surfaces are formed relative to a local coordinate system with the origin located at the center of the structure. The offset distance, if available, means the distance from the center of the structure. One can select a different field surface readily, and invoke the solver again (most likely with the *Field Only* option) to evaluate the sound field on different surfaces outside the structure.

Start Solver Launch the *FastBEM Acoustics*® solver to solve the BEM model (if job type is *Complete*) or evaluate the fields on the field surface (if job type is *Field Only*). A window showing the screen output pops up, which can be minimized so that the job runs in the background.

Commands on the **Postprocessor** menu, also on the **Tree Menu** on the left-hand side, are used to view:

- **log file** (*output.log*).
- **contour plots** of sound pressure, SPL, particle velocity and SIL results (in the file *output_result.dat*).
- **frequency response (FR) curves** in a multi-frequency analysis (results in the file *output_freq_responses.plt*). Settings of the FR curves can be modified by moving the curser over the FR curve plot and clicking the right mouse button to change the properties.
- **animations** of the results at the given frequency, if the animation option is selected.

These plot commands can be used in combinations with the options on the **View** panel on the right-hand side to have different effects for displaying the BEM results.
The **Plot Control** menu currently contains the following selections:

Pan/Zoom/Rotate, which brings up a dialog box with three sliders that can be used to pan, zoom or rotate the model in the GUI graphics display window. These functions can also be achieved by using the mouse buttons as follows (with a standard MS compatible three-button scroll mouse):

- To **rotate** the model on the screen, press and hold the **left-mouse button** and move the cursor around on the screen.
- To **pan** the model on the screen, press and hold the **right-mouse button** and move the cursor around on the screen.
- To **zoom** out and in the model, roll the **mouse scroll wheel** back and forth, respectively.

Light, which is used to change the direction of the light illuminating the model.

Normal Vector, which is used to display the element/cell normal vectors for checking the BEM models.

Screenshot, which is applied to capture the image on the screen and save it to a file. To use this function, select **Screenshot** and use the rainbow colored cursor to select an area by dragging a box on the screen, then double click to save the image to a file.

In the **Setting** menu, the range of the contour color bar, shade color for displaying the model and background color for the graphics window can be modified by selecting **Color Display Setting**, **Shade Color**, and **Background Color**, respectively.

The most often used commands are also available in the quick tool bar as illustrated in Figure 2.2.

The command **Create PDF file** is similar to the **Screenshot** command. However, it also saves the parameters used in the BEM model and analysis, along with the image you select using the rainbow-colored cursor, into a pdf file, which can be used to prepare a report.

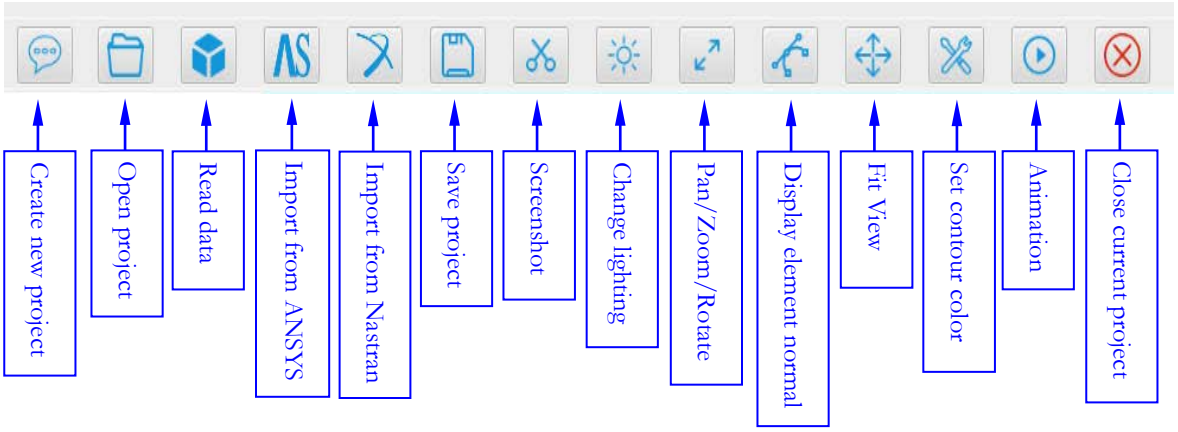


Figure 2.2. Functions of the icons in the quick tool bar.

To exit the GUI program, select **File/Exit**.

3. A Tutorial

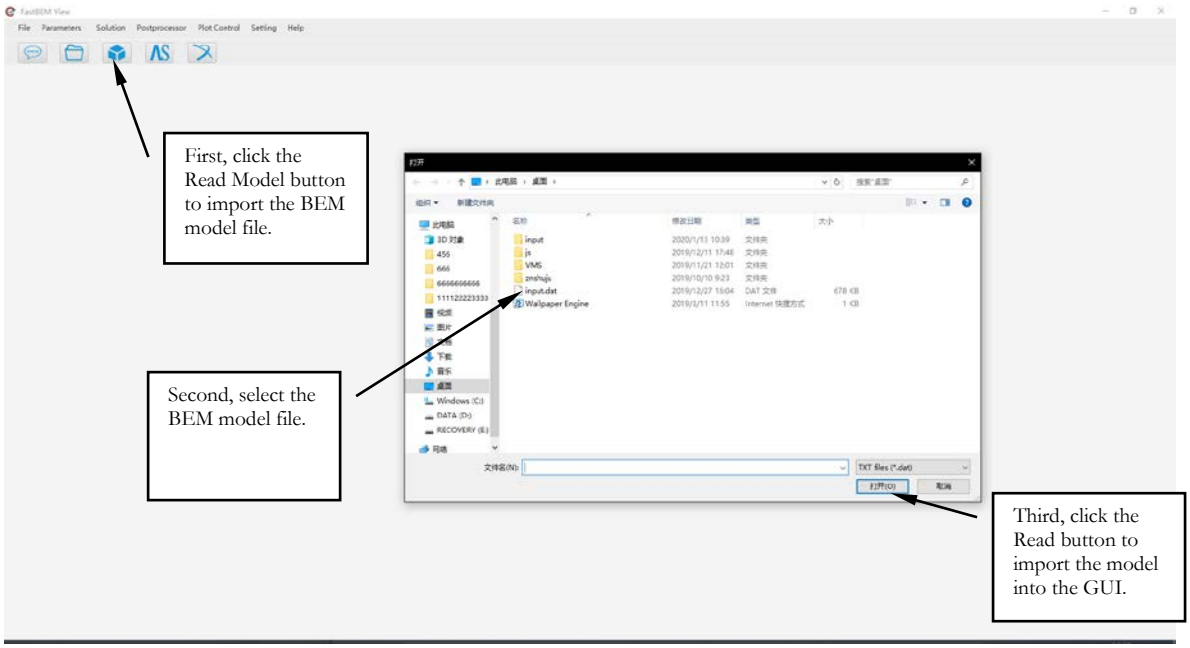
We use the sphere scattering model as an example to show how to use the GUI ***FastBEM View***® to view the model, launch the ***FastBEM Acoustics***® solver program and view the computed results. The rigid sphere in this example has a radius $R = 1$ and is applied with incident wave in the $-x$ direction. The BEM model file input_sample.dat is located in the installation folder:

C:\Program Files (x86)\FastBEM\FastBEM Acoustics\samples\input_files

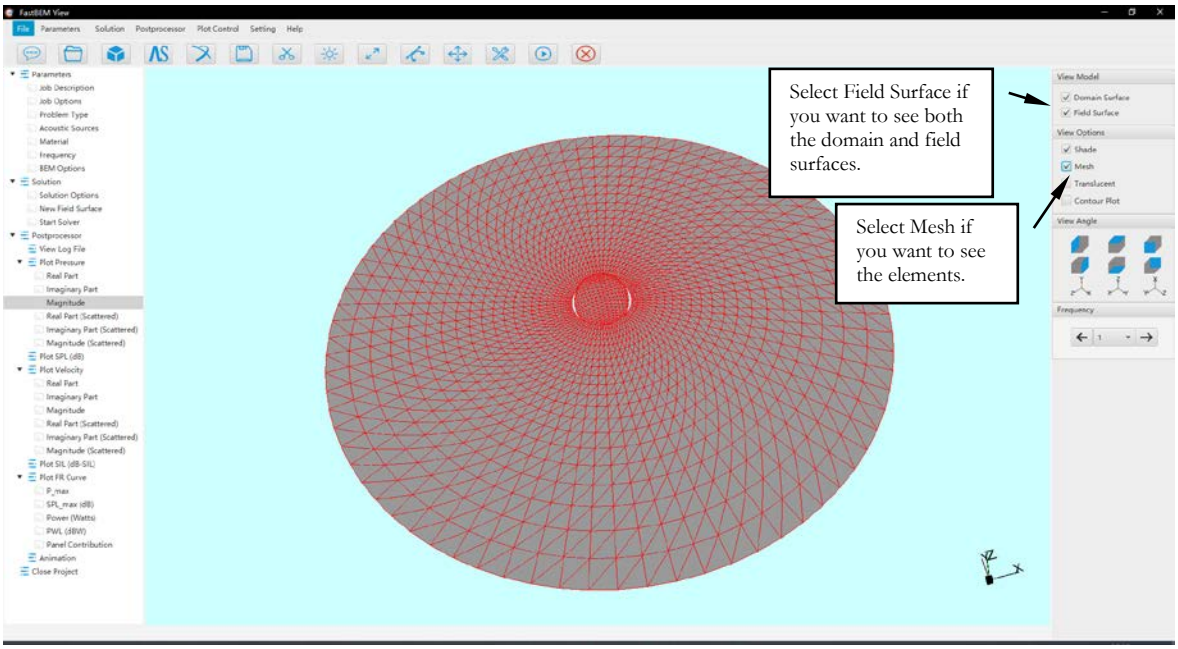
which may be different if you did not select the default folder during the installation.

Some basic steps are shown in the following to demonstrate usage of the GUI. More functions in the GUI can be explored by users.

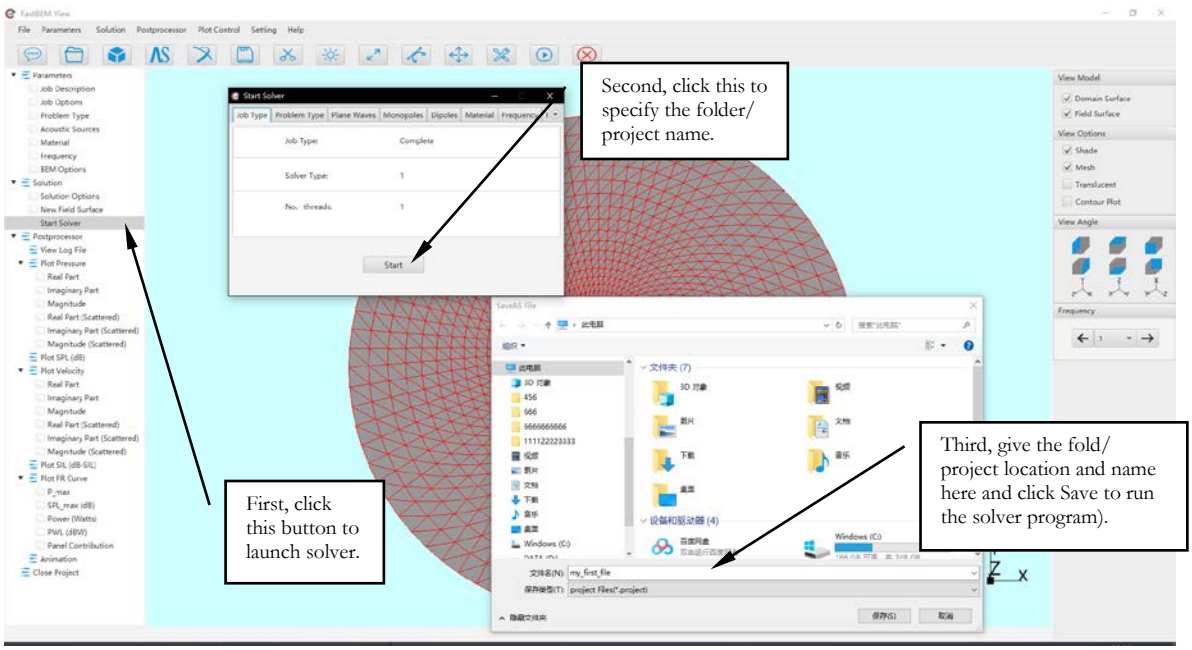
1. Launch the program ***FastBEM View***® (see Chapter 1). Follow the steps shown in following screenshot to import the BEM model into the GUI:



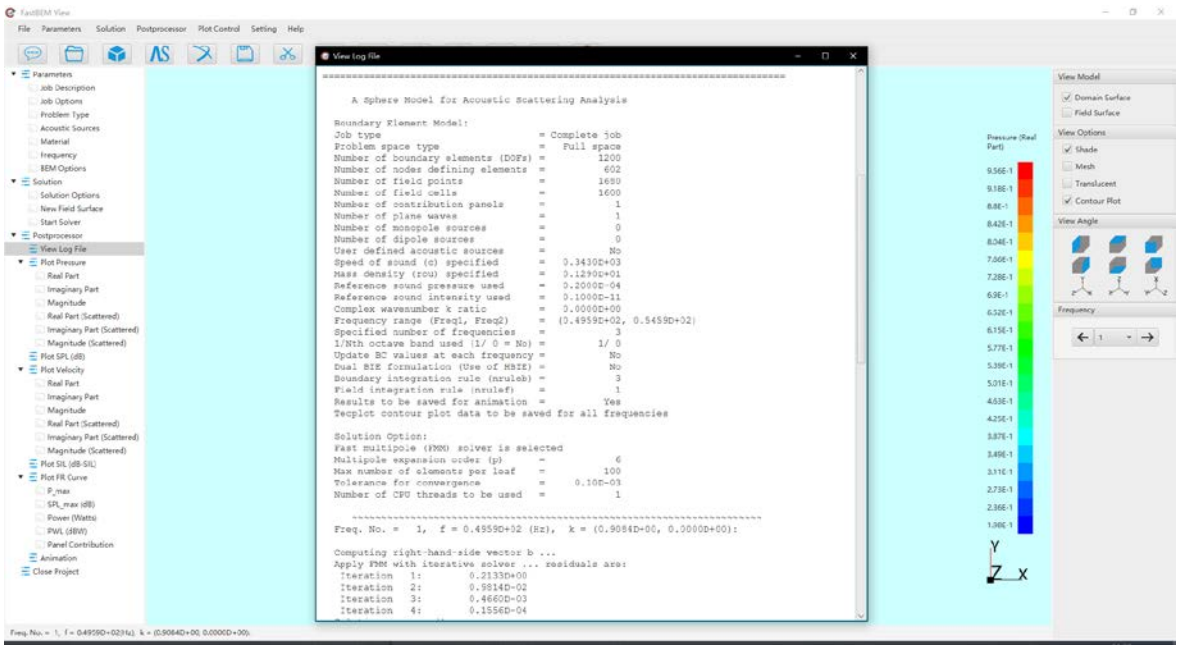
2. After the BEM model is imported into the GUI, use the selections shown in the following screenshot to see the field surface and the mesh (boundary elements and field cells)



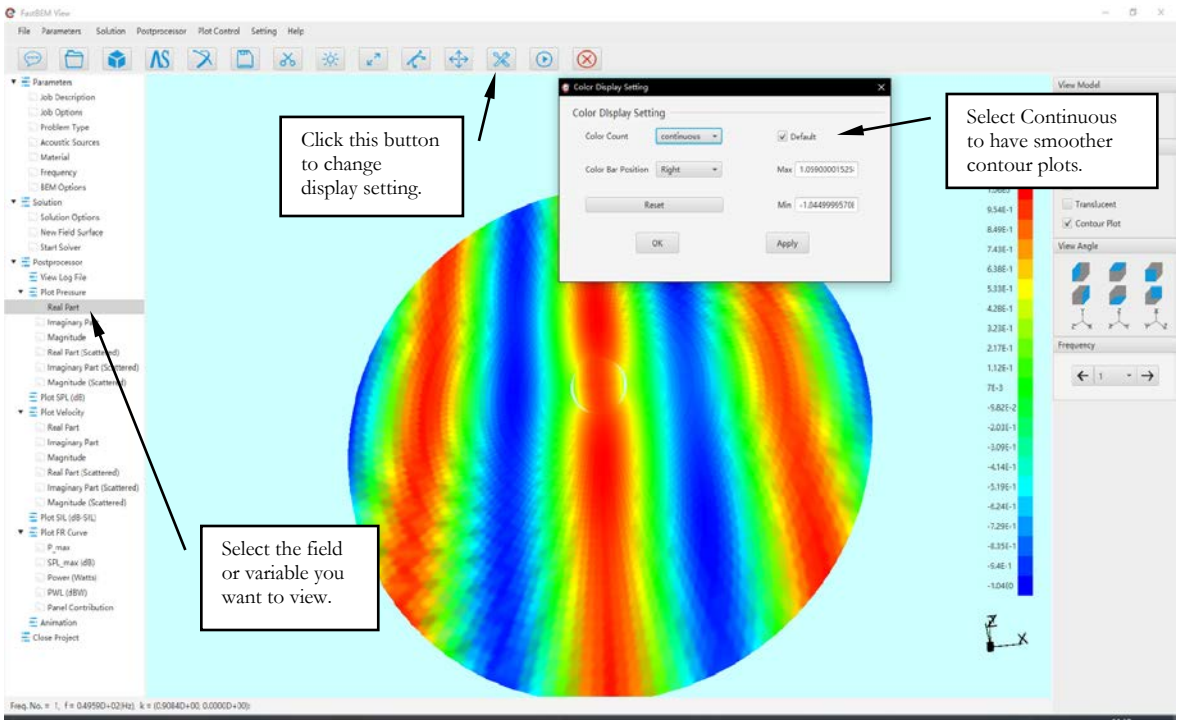
3. Check the parameters using the submenu under Parameters (see the following screenshot). If no changes are needed, click **Start Solver** to solve the BEM model.



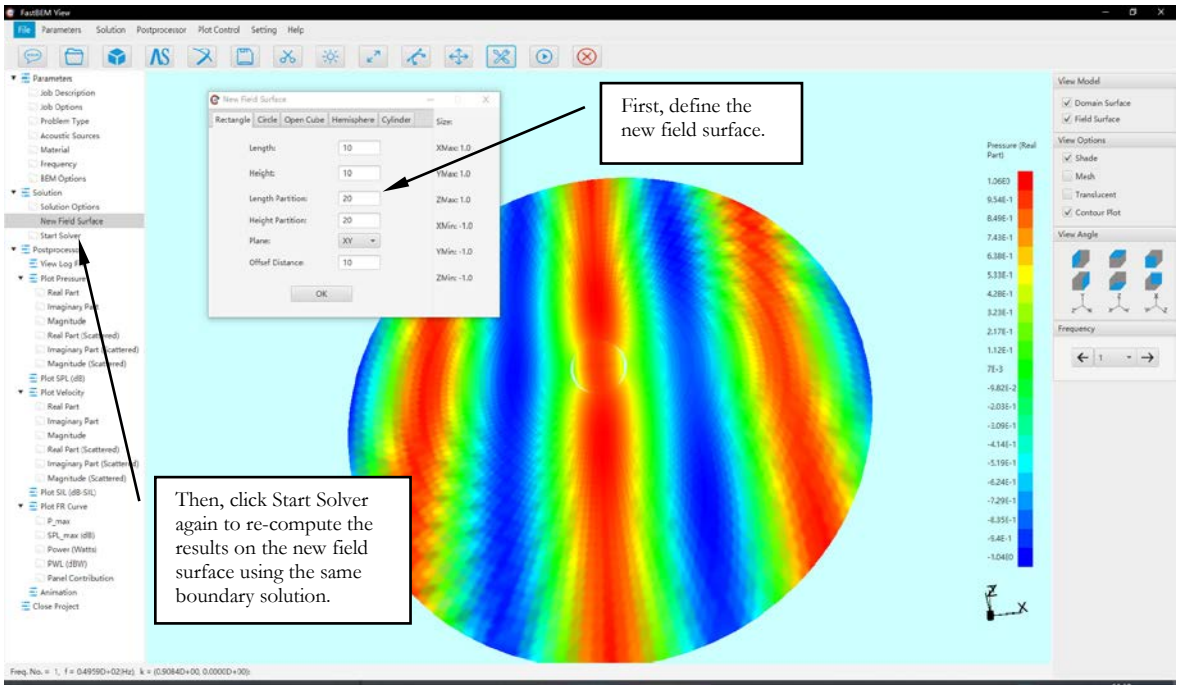
4. When solver finishes the job, click **View Log File** to review the output screenshot again (see the screenshot below):



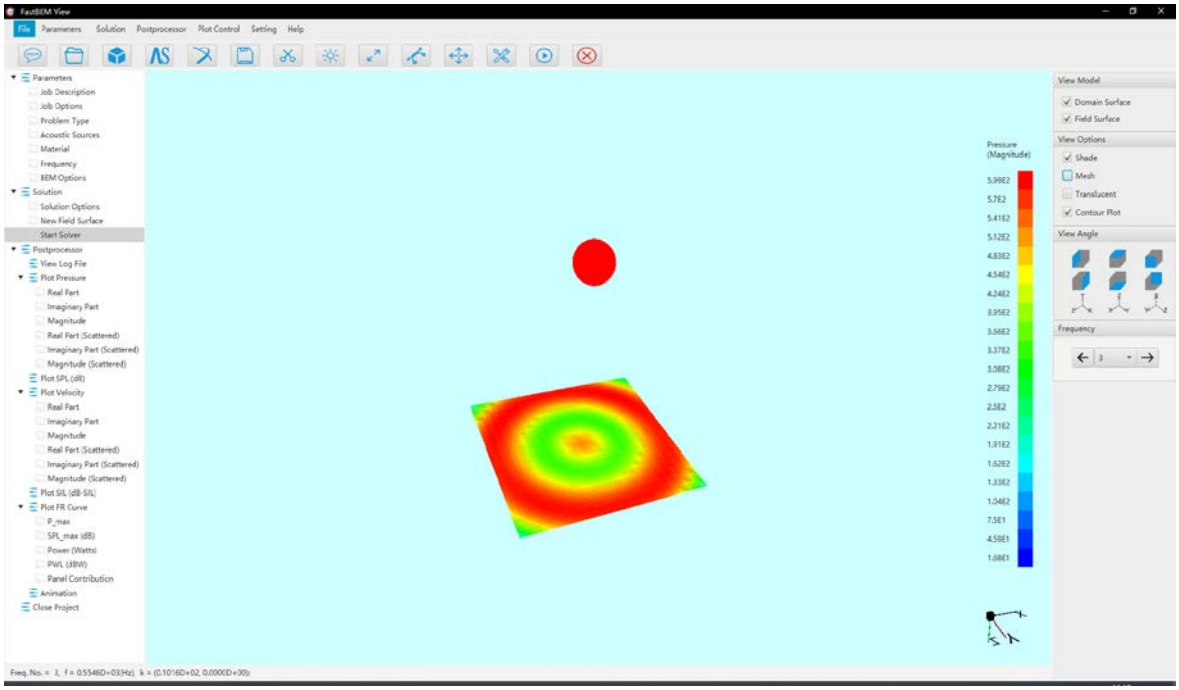
5. Select field to be plotted and change the setting for the plots (see the following screenshot):



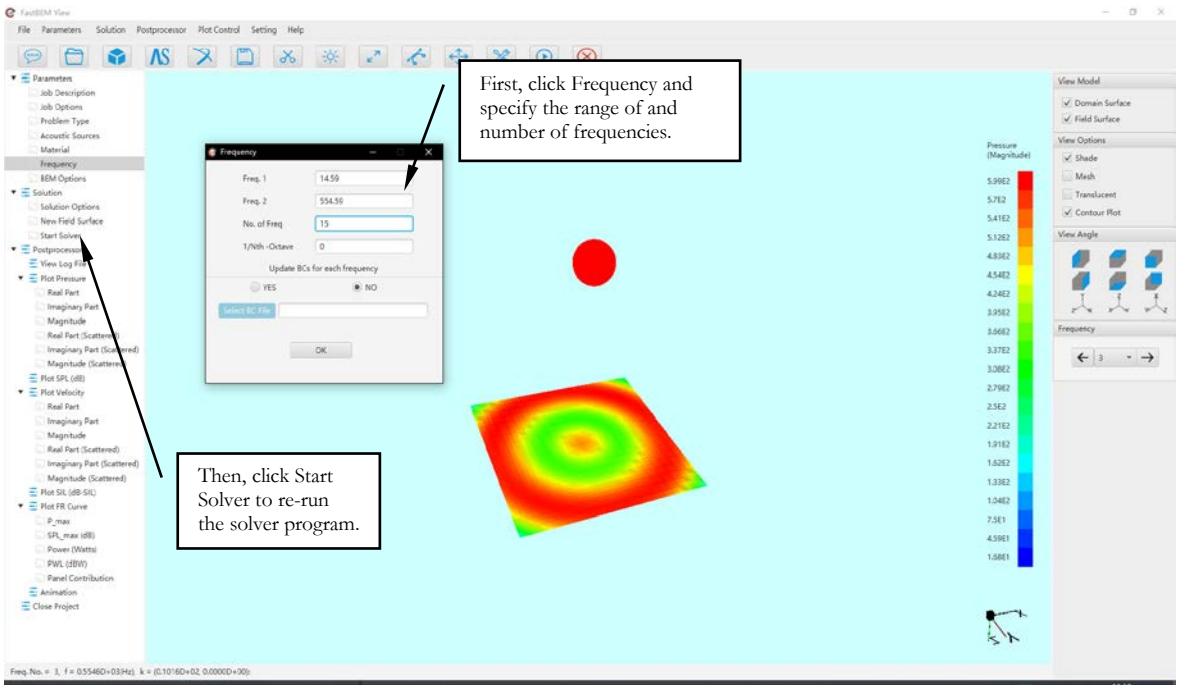
6. To see results on a different field surface, click **New Field Surface** button (see below figure):



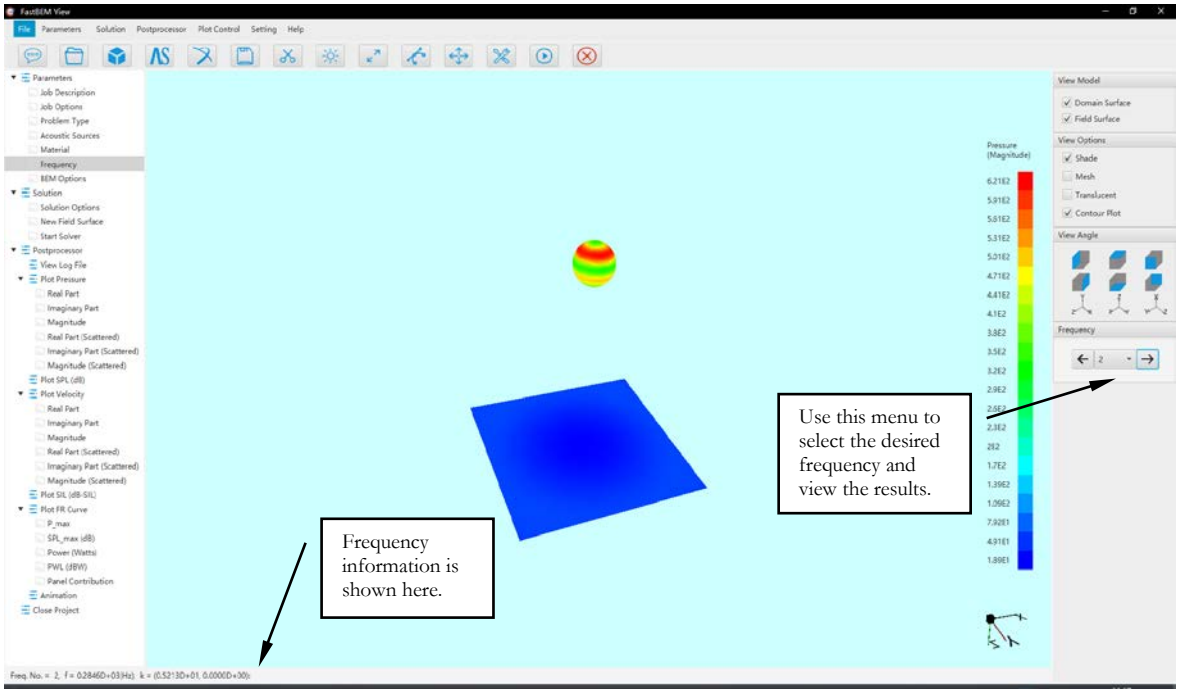
7. Results are displayed on the new field surfaces (see screenshot below):



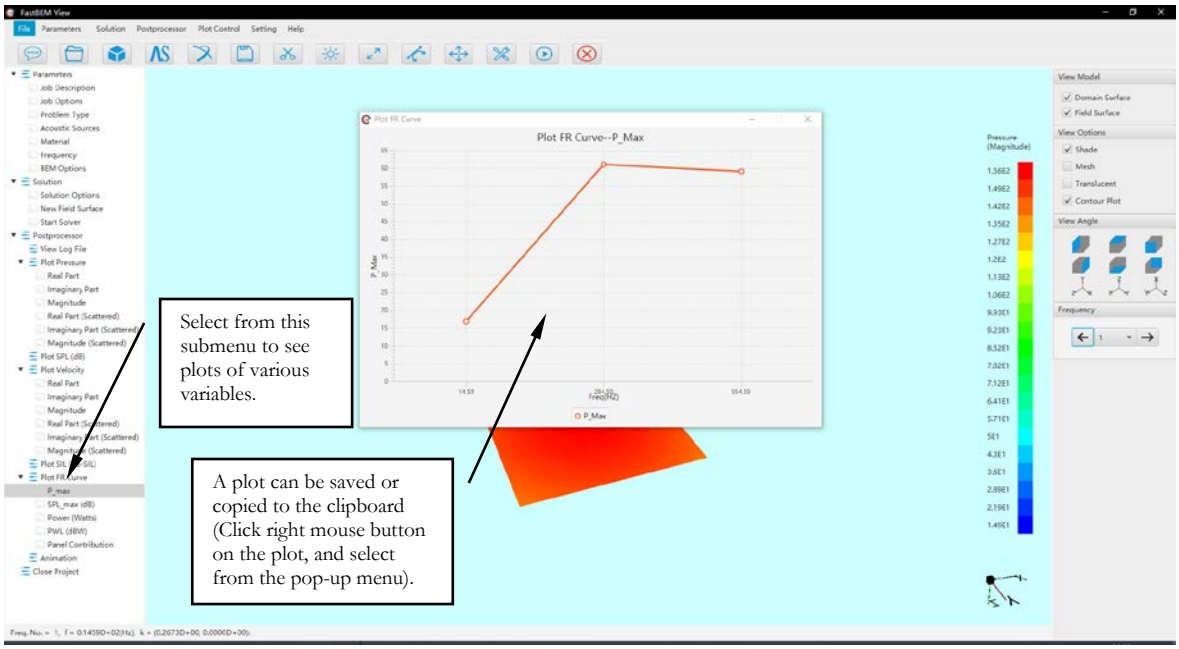
8. Change the single frequency analysis to a multiple frequency analysis (see below screenshot):



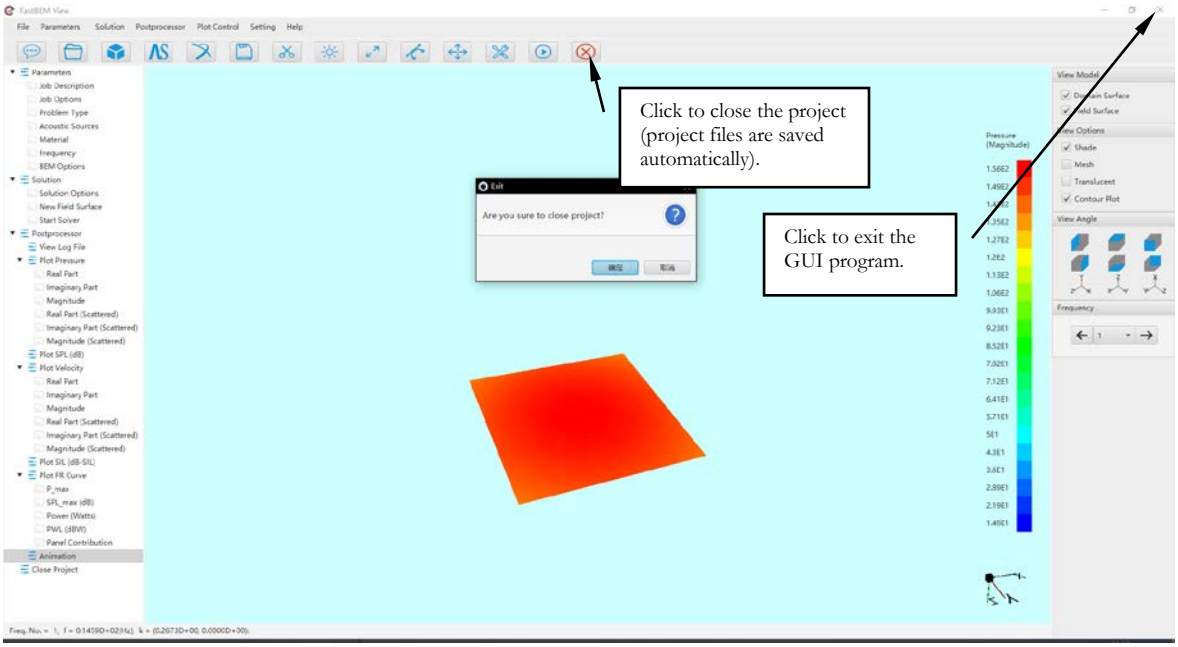
9. New results are displayed at different frequencies (see screenshot below):



10. Plot curves of various variables (see screenshot below):



11. Close the project and/or exit the GUI program (see screenshot below):



Technical Support

For technical support, send your e-mail to:

support@fastbem.com

For more information about the ***FastBEM Acoustics***® software package, visit the website:

www.*fastbem*.com