Question 7

Q: What are the suitable applications for acoustic impedance boundaries and open boundaries, respectively?

A: In cases where sound waves expand toward infinity, like Example 3, the open boundary is suitable.
In cases, where sound waves travel in one direction, like Example 7, the acoustic impedance boundary is suitable.

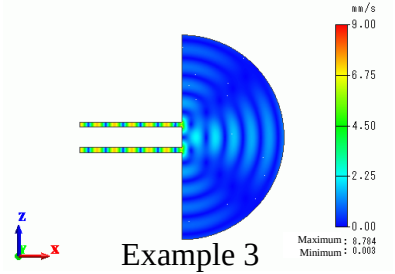
Please refer to the next slide.

Additional Information

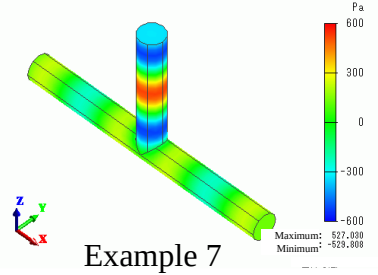
In cases where sound waves expand toward infinity, like Example 3, the open boundary is recommended. In cases, where sound waves travel in one direction, like Example 7, the acoustic impedance boundary is recommended.

The open boundary assumes sound pressure is in inverse proportion to the distance, R, from a sound source. If the point of interest is sufficiently far away from the sound source and a sound source is placed in a space free of spatial interrupting objects, sound pressure will decrease in proportion to 1/R and then the open boundary is applicable. If the point of interest is closer to the sound source, sound pressure shows more complex behaviors and includes the higher-order terms of 1/R^2. When the open boundary is applied, the higher-order terms are also taken into account to some extent.

When the acoustic impedance boundary is applied, the higher-order terms will not be taken into account. If the boundary is set closer to the sound source, the higher-order terms will then degrade the computation accuracy. If the sound waves travel in one direction, sound waves will not attenuate. In such a case, the acoustic impedance boundary is more appropriate than the open boundary.



Example 3



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