Simulation of Active Underwater Cylindrical Acoustic Antenna

R. Lardat[1]

[1]Thales Underwater Systems, Sophia Antipolis, France

Abstract

The simulation of a large acoustic cylindrical antenna made of numerous identical transducers is very often out of reach in terms of computational cost. Therefore the usual design procedure consist in optimizing the transducer standing alone, either in free field arrangement or sitting on a hard baffle. Once the antenna is produced, one can very often see problems arising on the antenna response because of the mutual acoustic coupling trough water. In this work, we explain the methodology to extract the full antenna response using a reduced meshed domain by using the periodicity of the antenna and the built-in cyclic boundary conditions offered by the software, see Fig 1 and Fig 2 for geometric representation. For an antenna using N periods along periphery, the size of the problem is divided by N at the expense of an increase (factor N) in number of runs. This technique allows getting the full response of the antenna with mutual acoustic coupling either in omnidirectional or in directive mode. In particular, it will be shown how to compute and represent within the COMSOL interface the radiated acoustic far field in the complete 3D domain whilst computing only one period of the antenna.

Figures used in the abstract

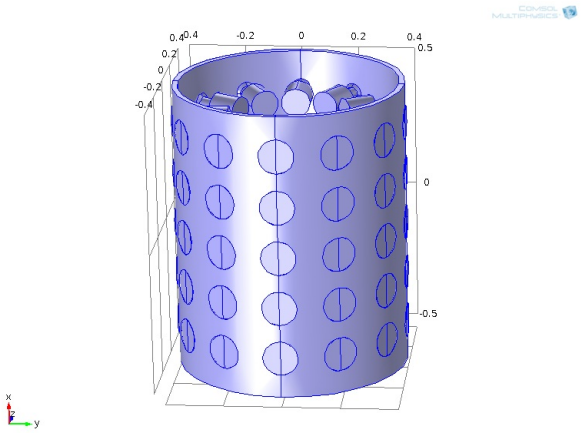

Figure 1: Full cylindrical antenna

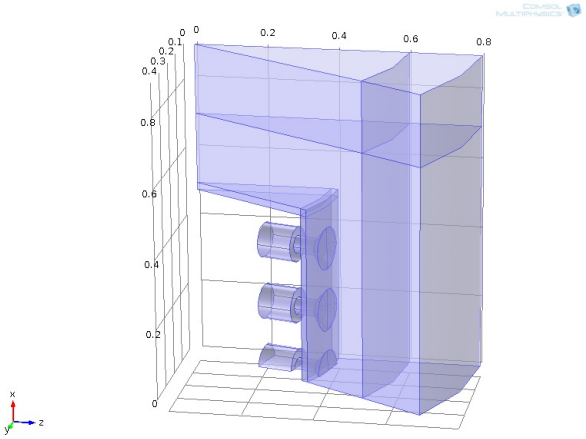

Figure 2: Computed domain