

Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Optimal Configuration of Large Arrays of Floating Bodies for Ocean Wave Energy Extraction GRGUR TOKIC, DICK K.P. YUE, Massachusetts Institute of Technology — We study the performance of large ($O(100)$) wave energy converter (WEC) arrays that are used for ocean energy harvesting. We developed a fast computational algorithm based on the multiple scattering framework that is capable of handling large arrays of different configurations (general finite-size arrays, periodic arrays, periodic arrays of subarrays); for axisymmetric bodies the algorithm imposes no constraints on the body-size-to-wavelength ratio or on the inter-body spacings. Using this fast algorithm, we optimize the spatial configurations of arrays of different types and with increasing number of bodies (up to 400), with the goal of maximizing energy extraction. The results show that employing non-uniform spacings between the bodies in ordered and non-ordered arrays can increase the array gain several times. This holds for body resonant and near-resonant frequencies, as well as for the full spectrum cases. The optimal configurations are analyzed from a physical standpoint and compared to other structured arrays in physics. These results give a guideline on the possible future design of WEC arrays.

Dick K.P. Yue
Massachusetts Institute of Technology

Date submitted: 31 Jul 2015

Electronic form version 1.4