

# Transfer Function Estimation with a Numerical Harmonic Probing Algorithm

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## ABSTRACT

Moored systems exhibit low stiffness in the horizontal degrees of freedom. This results in the structure having low natural frequencies and being sensitive to the low-frequency second order loads. Low-frequency loads arise as a result of inter-modulation of the wave frequencies. Accurate modeling of the low-frequency hydrodynamic loads is of crucial importance for developing cost-competitive floater designs. This study implements a Kriging-NARX model for forecasting hydrodynamic loads and a harmonic probing algorithm for extracting the transfer functions of the system. The implemented harmonic probing method is of numerical nature and avoids the use of computationally expensive symbolic coding tools. The method was tested on the INO WINDMOOR 12 MW floater for extracting the structure's linear transfer function. The obtained transfer function results showed an excellent agreement with potential flow and symbolic harmonic probing.

**Keywords:** NARX; Harmonic Probing; Transfer Function; Autoregressive; Hydrodynamic Loading.