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**Longitudinal Correlation Improvement with Model-based  
Technique**

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Longitudinal correlation coefficient is one of the most important parameters for signal processing in ocean acoustics. Multi-path interference is an important effect on the decrease of the longitudinal correlation for low frequency sound propagation in shallow water. In this research, the Frequency-Phase-Shift Relationship (FPSR) between the Frequency Response Function (FRF) of sound propagation at two horizontally separated locations based on waveguide invariant is derived. The validity of the FPSR is demonstrated by both numerical simulations and data from two experiments. Experimental data also show that the decrease of the longitudinal correlation coefficient of low frequency signals from explosive source due to multi-path interference can be conquered significantly with the FPSR. [Work supported by the National Natural Science Foundation of China under Grand No 10734100].