# 学 术 报 告

## ACADEMIC LECTURE

题目：**Physics-Based Modeling of Coherent Communications Performance in Environments with Strong Multi-Pathing**

时间：**2010年7月13日星期二上午9：00**

地点：微电子楼**131**会议室

报告人：**Dr. Daniel Rouseff , Applied Physics Laboratory, University of Washington**

- **Ph.D., University of Washington, Seattle**
- **Fellow of the Acoustical Society of America**

## 摘要

Time spread caused by multi-pathing and Doppler spread caused by a rapidly changing environment hamper coherent underwater communications. Some acoustic paths that are scattered by the sea surface might be treated as useful signal while other paths that are weak or varying too rapidly might be treated as noise. In the present study, a physics-based model is developed to predict the utility of different acoustic paths. Communications performance is specified in terms of the mean-squared error (MSE) in the soft demodulation output. The sea-surface scattering model is based on the Kirchhoff approximation and has as input such quantities as the communications bandwidth, the significant wave height, and the dominant period of the surface waves. Some paths that have undergone incoherent scattering by the rough sea surface are predicted to still be useful for coherent communications. The model is tested using binary phase-shift keyed (BPSK) data collected near the Hawaiian Island of Kauai. Good model-data agreement is demonstrated for data collected over several hours at various levels of surface roughness.
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## ACADEMIC LECTURE

题目：The Cooperative Array Performance Experiment
时间：2010年7月13日星期二下午2:00
地点：信电楼215会议室

报告人： Dr. Daniel Rouseff, Applied Physics Laboratory, University of Washington
- Ph.D., University of Washington, Seattle
- Fellow of the Acoustical Society of America

## 摘要

The Cooperative Array Performance Experiment (CAPEx) was performed in Lake Washington near Seattle in September 2009. The experiment was a collaboration between Chinese scientists from the Hangzhou Applied Acoustics Research Institute and American scientists from the University of Washington. Mid-frequency acoustic transmissions were recorded simultaneously on two vertical arrays: one a conventional 32-element pressure-sensor array, the other an 8-element array that measured both pressure and the three orthogonal components of acoustic particle velocity at each element. The first part of the talk is an overview of initial results from CAPEx. Data collected at short range demonstrate the relationship between the pressure and particle velocity fields. At more distant ranges, the particle velocity data are used to estimate the bearing to the source. Experimental results are compared to predictions generated using numerical models. The second part of the talk is a discussion of opportunities for future China/USA collaborations.

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## ACADEMIC LECTURE

题目：Underwater Acoustic Communications Using Time-Reversal Processing

时间：2010年7月14日星期三上午9：00

地点：信电楼215会议室

报告人：Dr. Daniel Rouseff , Applied Physics Laboratory, University of Washington

- Ph.D., University of Washington, Seattle
- Fellow of the Acoustical Society of America

## 摘要


Coherent underwater communication is hampered by the time spread and variability inherent to acoustic propagation in the ocean. Time-reversal signal processing, also called phase conjugation, produces pulse compression and therefore seems a natural approach for communications. Passive versions use a receive-only array to do combined temporal and spatial matched filtering. To compensate for the highly variable nature of the environment, decision-directed versions of time-reversal processing use past symbol estimates (decisions) to update the matched filters. After describing the algorithm, experimental results are reported. The data are also used as input to a simulator that predicts performance for various array geometries and bandwidths. The simulation results are shown to be consistent with analytical models. The results show how communications performance scales with bandwidth, with the number and position of array elements, and with the length of the finite impulse response matched filters. Good agreement is observed between the predicted scaling and that observed in field experiments.