

Title: *A Fast Algorithm to Solve Delay Vandermonde Systems*

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Abstract: Delay Vandermonde matrix (DVM) is a superclass of discrete Fourier transform matrix having entries as the powers of delays based on multibeam beamforming. The structure of DVM can be utilized to realize as an analog circuit answering applications in wireless communication. In this talk, we will present a fast and exact algorithm to solve a system of linear equations having the coefficient matrix as the DVM with order $n \times n$. Following the structure of the DVM, we first present a sparse factorization to solve the delay Vandermonde systems, efficiently. We use the proposed factorization to derive a fast algorithm with the arithmetic complexity of order $O(n^2)$ as opposed to $O(n^3)$. Next, we present numerical results for the forward accuracy of the proposed algorithm with different delays. Finally, the proposed algorithm is utilized to present a signal flow graph describing the architecture of an integrated circuit in connection to the phased-array digital receivers.