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MUSIC, CBF and Differential Algebraic Constant Modulus Algorithms for Direction of Arrival Estimation in Passive Coherent Locators

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Abstract: In passive coherent locators (PCL) systems, noise and the precision of direction of arrival (DOA) estimation are key issues. This paper addresses the implementation of high-resolution DOA estimation methods, in particular the multiple signal classification (MUSIC) algorithm, the conventional beam forming (CBF) algorithm, and the algebraic constant modulus algorithm (ACMA). The goal is to compare the ACMA to the MUSIC and CBF algorithms for application to PCL. The results and analysis presented here support the use of constant modulus information, where available, as an important addition to DOA estimation. The ACMA offers many simple solutions to noise and separation related problems; at low signal-to-noise ratio levels, it provides much more accurate estimates and yields reasonable separation performance even in the presence of challenging signals. Differential ACMA, which allows the simple digital removal of the direct signal component from the output of a sensor array, is also introduced.

Key Words: Passive Radar, Direction of Arrival (DOA), Passive Coherent Locators (PCL), Blind Source Separation, Array Antenna, Conventional Beamforming (CBF), Multiple Signal Classification (MUSIC), Differential, Algebraic Constant Modulus Algorithm (ACMA)