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# Target Detection using Weather Radars and Electromagnetic Vector Sensors <sup>☆</sup>

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## Abstract

We propose a method to detect a target in a bistatic passive polarimetric radar network, with weather surveillance radar as our illuminator of opportunity (IO). We build our signal model using electromagnetic vector sensors (EMVS) as the receiver, which captures the reflections from a point-like target present in the scene of interest, surrounded with strong clutter. We develop a generalized likelihood ratio test (GLRT) detector that is robust to inhomogeneous clutter. We also develop a maximum likelihood (ML) solution to extract the signal subspace from the received data contaminated by the clutter interference. We provide the exact distribution of the test statistic for the asymptotic case and evaluate its performance loss by considering a reduced set of data. The proposed GLRT method is a constant false alarm rate (CFAR) detector, which makes it robust against the inhomogeneous clutter. With the help of numerical results, we demonstrate the robustness and the limitations of our proposed method.

*Keywords:* Target detection, Electromagnetic vector sensors, Passive radar, Weather radar

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## 1. Introduction

Improving the detection performance of a target can be important for military and surveillance operations. Over the last decade, there has been a growing interest in the

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