

# Comments

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## General Comments

The publication delves into statistical methodologies for estimating variance in scenarios where data are affected by intermittent interferences, particularly focusing on applications to incoherent scatter radar (ISR) signal processing.

The theoretical basis of this study is rooted in a branch of statistical analysis designed to develop methods resistant to deviations from assumed distributions, particularly outliers. The paper addresses the specific challenges associated with estimating the power spectral densities and Doppler velocities in ISR applications where the data is normally distributed but occasionally contaminated by signals from various sources like other radars or natural phenomena.

### Key Theoretical Foundations:

**Statistical Framework:** The authors employ robust estimators for variance, which are less sensitive to outliers compared to traditional estimators like the sample mean. The estimators are tested against a normally distributed random variable superimposed with noise. This setup is typical in radar signal processing where the variance of the signal (either desired or undesired) is a crucial parameter.

### Robust Estimators Utilized:

- **Geometric Mean and Median-Based Estimators:** Known to be less influenced by extreme values, thereby providing more reliable variance estimates under interference conditions.
- **Hybrid Estimator:** Combines the sample mean with a robust estimator to leverage the low bias of the mean while reducing the influence of outliers through the robust component.

The authors simulate the impact of interference by introducing additional noise to the normal distribution, varying the strength and frequency of this noise to assess estimator performance across different scenarios. Then, they apply these robust statistical techniques to ISR data, particularly looking at signals affected by sporadic E layers, where interference is common.

The theoretical discussion explains why certain estimators are more effective in the presence of noise. The use of robust statistical methods is well-justified given the high likelihood of signal contamination in the application context. The paper effectively bridges the gap between theoretical statistical methods and practical applications.

