# Predictability Assess of Multipath Phase Using ARIMA Model

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## Abstract

© 2020 IEEE. Physical Layer Security is a promising technique for establishing a secret encryption key in wireless communications. The secret key is distilled from the Channel State Information under conditions of its random fast fading. However, random channel variations are quite smooth on short-term intervals and can be predicted using previous samples. This is a serious threat to secrecy of the generated encryption key. In this study, we assess both prediction error and prediction horizon for real data set of a fast fading carrier phase using the ARIMA model. Influence of the autoregressive model order on the prediction accuracy is considered, optimum ARIMA parameters for forecasting the experimental data are found. We also compare prediction accuracy of the ARIMA that uses fixed model parameters versus accuracy of the auto-ARIMA that employs adaptive estimation of model parameters in different timeframes of the data. Our results showed that effective prediction of real samples of multipath phase was possible only at intervals shorter than 150 ms, and maximum prediction gain did not exceed 40 degrees compared to prediction based on the last known sample.

## Keywords

ARIMA model, autoregressive models, carrier phase, channel prediction, fast fading, multipath radio propagation, physical layer security, wireless key distribution

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