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Analysis of Polarization Diversity Applicability in Meteor Key Distribution Systems

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Abstract

Natural randomness of meteor-scatter channel can be used for establishing a shared encryption key. In order to improve the key generation rate, a new method is proposed that allows sampling two independent measurements of carrier phase from each meteor radio reflection. The method relies on a time multiplexing of polarization of probing signals. Using a computer simulation based on numerical calculations of oblique diffraction of radio waves on ionized meteor trails, estimates of polarization coherence interval of the meteor-scatter channel are performed. Correlation functions of carrier phase versus polarization diversity of the probing signals are obtained both for the cases of horizontally and vertically polarized antennas. It is shown that, theoretically, use of the proposed polarization diversity technique provides a twice higher key generation rate compared to previous studies. On the other hand, the proposed method demands a very precise tuning of antenna polarization, which may be difficult for a practical implementation.

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Keywords

channel nonreciprocity, coherence interval, correlation, diffraction, encryption key, meteor burst communication, polarization diversity, radio reflection

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