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## Impacts of fast flat fading channel on the performance of a primary-secondary user power control game for cognitive radios

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**Abstract:** Power control is an important concern in cognitive radio networks in which secondary users opportunistically compete to access spectrum allocated to primary users. However, most existing studies in this regard have ignored the impact of primary users and only considered the interactions between secondary users. In this study the novel primary-secondary game-theoretic scheme is extended to realistic wireless channels in which primary users are rewarded for sharing their spectrum with secondary users, allowing them to achieve energy-efficient transmissions. The proposed model is analyzed for both Rician and Rayleigh fast flat fading channels and closed-form expressions are also derived for the average utility functions and the existence of a unique Nash equilibrium is also shown. Finally, detailed simulation results are presented to verify the realistic performance of the scheme under those new channel conditions.