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**Multiuser cognitive radio networks: an information-theoretic perspective.** (English)

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**Summary:** Achievable rate regions and outer bounds are derived for three-user interference channels where the transmitters cooperate in a unidirectional manner via a noncausal message-sharing mechanism. The three-user channel facilitates different ways of message-sharing between the primary and secondary (or cognitive) transmitters. Three natural extensions of unidirectional message-sharing from two users to three users are introduced: (i) Cumulative message sharing; (ii) primary-only message sharing; and (iii) cognitive-only message sharing. To emphasize the notion of interference management, channels are classified based on different rate-splitting strategies at the transmitters. The techniques of superposition coding and Gel'fand-Pinsker's binning are employed to derive an achievable rate region for each of the cognitive interference channels. The results are specialized to the Gaussian channel, which enables a visual comparison of the achievable rate regions through simulations and help us achieve some additional rate points under extreme assumptions. We also provide key insights into the role of rate-splitting at the transmitters as an aid to better interference management at the receivers.

**MSC:**

94A15 Information theory (general)

**Keywords:**

cognitive radio channels; achievable regions; outer bounds; superposition coding

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