THE EFFECT OF RECEIVER DIVERSITY COMBINING ON OPTIMUM ENERGY ALLOCATION AND ENERGY EFFICIENCY OF COOPERATIVE WIRELESS TRANSMISSION SYSTEMS

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Scenario

$|h|^2 = H$
$|g_r|^2 = G_r$

$y_r = |h| a_s x + w_r$

$y_{d1} = |g_s| a_s x + w_{d1}$

$y_{d2} = |g_r| a_r y_r + w_{d2}$

Destination receives two observations of the same information

Problem Statement

• Optimum energy allocation strategy to minimize the total energy
• Effect of diversity combining techniques on energy efficiency and energy allocation

System Model

• Amplify & Forward Protocol
• Rayleigh fading channels with AWGN
• Destination uses MRC or EGC
• Channel amplitudes are known

Related Work


SNR Analysis

$\text{SNR}_{\text{mrc}} = G_s \mathcal{E}_s + \frac{H \mathcal{E}_s G_r \mathcal{E}_r}{1 + H \mathcal{E}_s + G_r \mathcal{E}_r}$

$\text{SNR}_{\text{egc}} = \frac{G_s \mathcal{E}_s}{2} + \frac{\mathcal{E}_s G_r \mathcal{E}_r (H - \frac{G_s}{2}) + 2 \mathcal{E}_s (G_r G_s \mathcal{E}_r H (H \mathcal{E}_s + 1))^{1/2}}{2 (H \mathcal{E}_s + 1) + G_r \mathcal{E}_r}$

$\mathcal{E}_s$ denotes the source energy, $\mathcal{E}_r$ denotes the relay energy