Communication to Minimize Electromagnetic Exposure

**Introduction and Motivation**

- Portable wireless devices expose the human body to electromagnetic radiation during transmission.
- Regulators use specific absorption rate (SAR) as a measure of tissue heating caused by the radiation.
- SAR limits are strictly regulated by the FCC and many modern devices operate near the acceptable limit.
- Our goal is effectively incorporate SAR constraints into coding schemes so as to reduce SAR.

**Past Work**

- Past work has focused on hardware solutions, such as antenna designs and direct radiation away from the body and the use of materials that absorb most of the energy.
- There is little to no work on signal processing techniques to reduce SAR.

**Past Work Analysis**

- The SAR code designed in [1] has been analyzed in order to understand the effect of SAR constraints on communication systems.
- Pairwise error probability (PEP) for high SNR, where
  \[
  P(\text{Pe}) = \frac{1}{3} \frac{1}{d_1^2 d_2^2} \frac{1}{\text{SNR}^2},
  \]
  Diversity of the SAR Code is 1.
- Theoretical result has been verified using a MATLAB simulation.

**SAR Code Analysis**

- SAR code from [1] provides a significant decrease in SAR compared to standard space-time codes but is difficult to decode.
- Goal is to design a two antenna space-time block code with lower SAR than standard space-time codes but with a reasonable decoding complexity and a comparable diversity gain.

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**References**
