

## Network coded LDPC code design for a multi-source relaying system

### Abstract:

We investigate LDPC code design for a multi-source single-relay system, with uniform phase-fading Gaussian channels. We specifically consider the asymmetric channels for multiple sources, where the channel condition for each source in the system is different. We focus on LDPC code design when network coding (NC) at the relay is utilized. For the asymmetric sources, we firstly introduce a binary field rate splitting theorem which is used to discover an appropriate NC scheme at the relay. This NC scheme is then used to determine the achievable rates of each source and the whole system. These steps assist us in the development of the main contribution of our work, namely, network coded multi-edge type LDPC (NCMET-LDPC) code design. Extrinsic mutual information transfer (EXIT) chart analysis is utilized to optimize the code profiles. Our results demonstrate two key points. (1) From the whole system point of view, our NCMET-LDPC codes achieve better error performance than that of LDPC codes designed for the system without NC. (2) As a consequence of the binary field rate-splitting theorem, our NCMET-LDPC codes also guarantee better error performance of each asymmetric source. The improvement in error performance is typically about 0.3 dB relative to a system without NC.