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Spectrum Sensing in the Presence of Multiple Primary Users

- **L. Wei, O. Tirkkonen, Aalto Univ., Finland**
- Use what they call a spherical test for sensing multiple PUs
- $X = Hs + \sigma n$, where x is K-dimensional (K CRs), s is P-dimensional (P PUs), i.i.d. zero mean Gaussian dist.
- $R = E(X X^{\wedge H})$ white Wishart (H0) vs. correlated Wishart (H1)
- Single primary user
  - Known noise variance: $T_{LE} = \lambda_1(R)$ is GLRT optimal
  - Unknown noise var.: $T_{SLE} = \lambda_1(R)/Tr(R)$ is GLRT optimal
- Multiple primary users H0: $R = \sigma^2 I_k$ vs $R > \sigma^2 I_k$
- Spherical test: $T_{ST} = \det(R)/(Tr(R)/K)^K$
- Analyze performance using beta approximations to PDFs
  - Improved performance compared to other existing tests in the presence of multiple primary users

Medium Access Control Protocols for Wireless Sensor Networks with Energy Harvesting

- **F. Iannello, O. Simeone, U. Spagnolini, Politech. di Milano and NJIT**
- Conv. WSN MAC design – max network lifetime
  - Assumes battery operated nodes
- Design & analysis of MAC protocols: TDMA, Framed ALOHA (FA) and Dynamic FA
- System performance measures: *(1) delivery probability*
  - Number of sensors' measurements successfully reported to FC
- *(2) Time efficiency*
  - Rate of data collection at the FC

Finite-SNR Diversity-Multiplexing Trade-Off of Dual Hop Multiple-Relay Channels

- **Y. Liu, P. Dharmawansa, M.R. McKay, K.B. Letaief, HKUST**
- Point-to-point links assisted by (AF or DF) relays
- AF protocol: tight approximations to outage probability when relays are clustered
- DF protocol: outage probability with arbitrary relay config.
- Conventional (infinite-SNR) DMT can significantly overestimate the DMT achievable at finite SNRs
  - Also, behavior highly non-linear, unlike the piecewise linear infinite-SNR DMT results

On the Energy Efficiency-Spectral Efficiency Trade-off over the MIMO Rayleigh Fading Channel

- **F. Heliot, M.A. Imran, R. Tafazolli, U. Surrey, UK**
- Consider the trade-off between EE and SE
  - R = data rate (bits/s), P = tx power (W), EE = energy/bit = P/R = Eb.
  - Max. SE = Channel capacity per unit BW (bits/s/Hz) = C = log(1+P/ N_0 W) (AWGN channel). Achievable SE = R/W (bits/s/Hz).
  - Tradeoff: $E_b/N_0 = f^{-1}(C)/S$, where $C = f(P/N_0W)$
- Total energy consumption, not just tx energy, is important
- Previous studies: EE-SE trade-off in the low SE regime
- This work: EE-SE trade-off for Rayleigh fading
  - Valid for a much wider range of SE
  - Model total energy consumption, not just tx energy
  - Compare SISO to MIMO systems in terms of the trade-off