APPENDIX I
SIMPLIFICATION OF MULTIUSER DIVERSITY MODEL

- Standard model for system with $s_k^{(n)}(t) = s(t)$, all k and synchronous signals, flat channel:

  - antenna m:

$$r_m(t) = \underline{s}(t)\, C_m\, A\, \underline{b} + n_m(t)$$

where $\underline{s}(t) = [s(t) \cdots s(t)] = s(t)\underbrace{[1, 1, \cdots, 1]}_{K}$

$$C_m = \begin{bmatrix} c_{1m} & & \\ & c_{2m} & \\ & & \ddots \\ & & & c_{Km} \end{bmatrix} \qquad A = \mathrm{diag}[A_1, \ldots, A_K]$$

  - after correlation with $s(t)$:

$$y_m = [1, 1, \cdots 1] \begin{bmatrix} c_{1m} & & & \\ & c_{2m} & & \\ & & \ddots & \\ & & & c_{Km} \end{bmatrix} A\, \underline{b} + \underline{v}$$

$$= [c_{1m}\, c_{2m} \cdots c_{Km}]\, A\, \underline{b} + \underline{v}$$

  - stacking them,

$$\underline{y} = \begin{bmatrix} y_1 \\ \vdots \\ y_m \end{bmatrix} = \begin{bmatrix} c_{11} & c_{21} & \cdots & c_{K1} \\ c_{12} & c_{22} & & \\ \vdots & \vdots & & \vdots \\ c_{1M} & c_{2M} & & c_{KM} \end{bmatrix} A\, \underline{b} + \underline{v}$$

(unfortunate subscript reversal)

$$\underline{y} = C\, A\, \underline{b} + \underline{v}$$