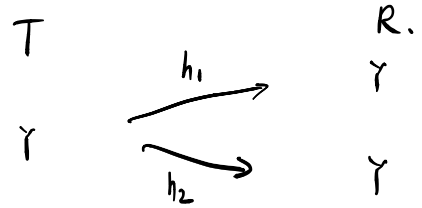
2.



(a) MRC: $\frac{1}{N}\sum_{i=1}^{N} \frac{r_i^2}{N_i} = \bar{\gamma}$

$$\gamma = \sum_{i=1}^{N} \frac{r_i^2}{N_i} = 2\bar{\gamma}$$

SC: $\gamma = \bar{\gamma}(1+\frac{1}{2}) = \frac{3}{2}\bar{\gamma}$

(b) SC: $P_{out}(\gamma_{th}) = \prod_{i=1}^{2} (p(\gamma_i < \gamma_{th})) = \prod_{i=1}^{2} (1-e^{-\gamma_{th}/\bar{\gamma}})$

$$= (1-e^{-\gamma_{th}/\bar{\gamma}})^2$$

MRC: $P_{out}(\gamma_{th}) = \int_0^{\gamma_{th}} \frac{\gamma e^{-\gamma/\bar{\gamma}}}{\bar{\gamma}^2} d\gamma$

$$= 1 - e^{-\gamma_{th}/\bar{\gamma}}(1+\frac{\gamma_{th}}{\bar{\gamma}})$$

(c):

(d): array gain: MRC $= 2$

SC: $\frac{3}{2}$

diversity order: $\bar{P}_s = \int_0^{+\infty} P_s(\gamma) p_\gamma(\gamma) d\gamma$.

$$\overset{MRC}{=} \int_0^{+\infty} P_s(\gamma) \frac{\gamma e^{-\gamma/\bar{\gamma}}}{\bar{\gamma}^2} d\gamma.$$

$$\overset{SC}{=} \int_0^{+\infty} P_s(\gamma) \frac{M}{\bar{\gamma}}(1-e^{-\gamma/\bar{\gamma}}) e^{-\gamma/\bar{\gamma}} d\gamma$$

Let $P_s = \alpha_M \cdot Q(\sqrt{\beta_M \gamma})$. $Q(x) \le e^{-x^2/2}$.

for MRC: $\bar{P}_s \le \alpha_M \prod_{i=1}^{2}(\frac{1}{1+\beta_M\bar{\gamma}/2})$ $\bar{P}_s \approx \alpha_M (\frac{\beta_M \bar{\gamma}}{2})^{-2}$ so. diversity order $= 2$

for SC: $\bar{P}_s \leq \int_0^{+\infty} \alpha_m e^{-\beta_m \gamma/2} \frac{2}{\bar{\gamma}} (1-e^{-\gamma/\bar{\gamma}}) e^{-\gamma/\bar{\gamma}} d\gamma.$

$$= \frac{8\alpha_m}{8+6\beta_m\bar{\gamma}+\beta_m^2\bar{\gamma}^2}$$

so. diversity order ≈ 2