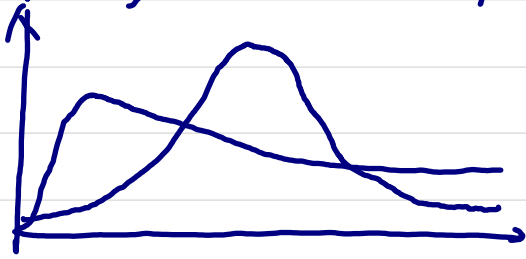
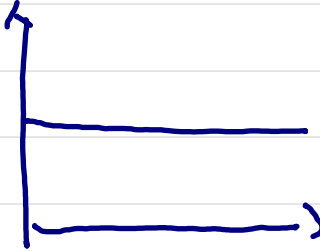
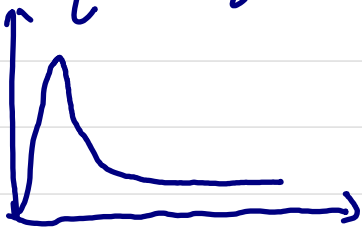


$$1. X \sim \mathcal{N}(\mu, \sigma^2) \rightarrow X = \mu + \sigma \cdot \text{randn}$$



log-normal: $\log S$ is in normal distribution
 $db \sim \text{pow}(\cdot)$

$$2. \sqrt{\frac{1}{2}} \cdot (\text{randn} + i \cdot \text{randn})$$

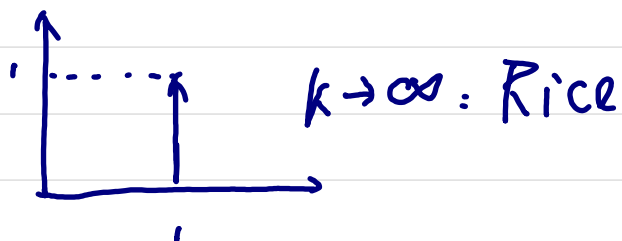
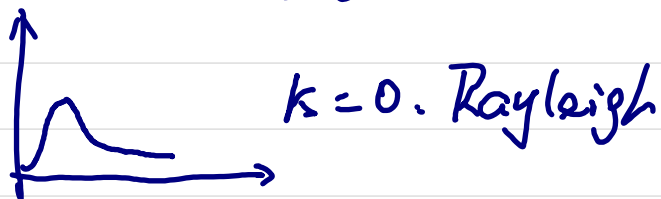


$$3. \quad h = \sqrt{\frac{k}{1+k}} \tilde{h} + \sqrt{\frac{1}{1+k}} \bar{h}$$

Ricean factor $k \in \mathbb{R}_{++}$

how much energy is in LOS path

$|h|$ distribution:

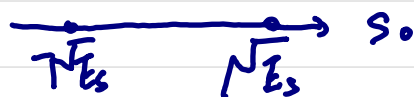


4. $n = 1$: $|h|^2 \sim \text{Exp}(\frac{1}{\sigma^2})$

5. AWGN channel: $T_x \rightarrow \oplus \rightarrow R_x$
 $y = x + n$

fading channel: $T_x \rightarrow \otimes \rightarrow \oplus \rightarrow R_x$
 $y = hx + n$

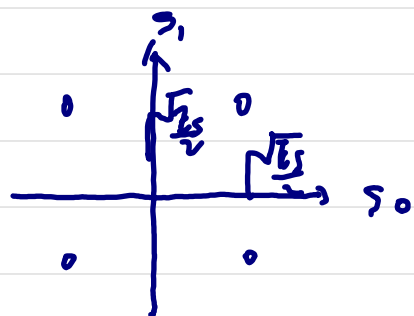
BPSK:



bits: 01001

↓
 symbols { BPSK:
 QPSK:

QPSK:



W1: encode / rate
BER

noise $\rightarrow R_x$

MRT vs Alamouti: normalize W_C

diversity: information symbols pass through multiple independent fading channels.

① repetition coding^(t.f.1): same symbol over several paths

- max diversity gain
- no coding gain

② Alamouti:

array gain - SNR

diversity gain - # independent fading paths

multiplexing gain - (sum) rate

coding gain - tx power (to achieve same product distance)

