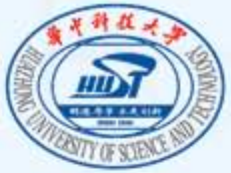

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FM Reliablity

Reliability Comparison —SNR

- Single Interference V_n
  - FM: $(SNR)_{FM} \approx m_f \frac{V_s}{V_n}$ $\quad m_f \gg 1$
  - AM: $(SNR)_{AM} \approx m_a \frac{V_s}{V_n}$ $\quad m_a < 1$

$\Delta f_m = m_f F$

FM superior to AM

- White Noise
  - Wideband FM $(m_f > 0.6)$ superior to AM
  - Narrowband FM $(m_f < 0.6)$ $\approx$ AM

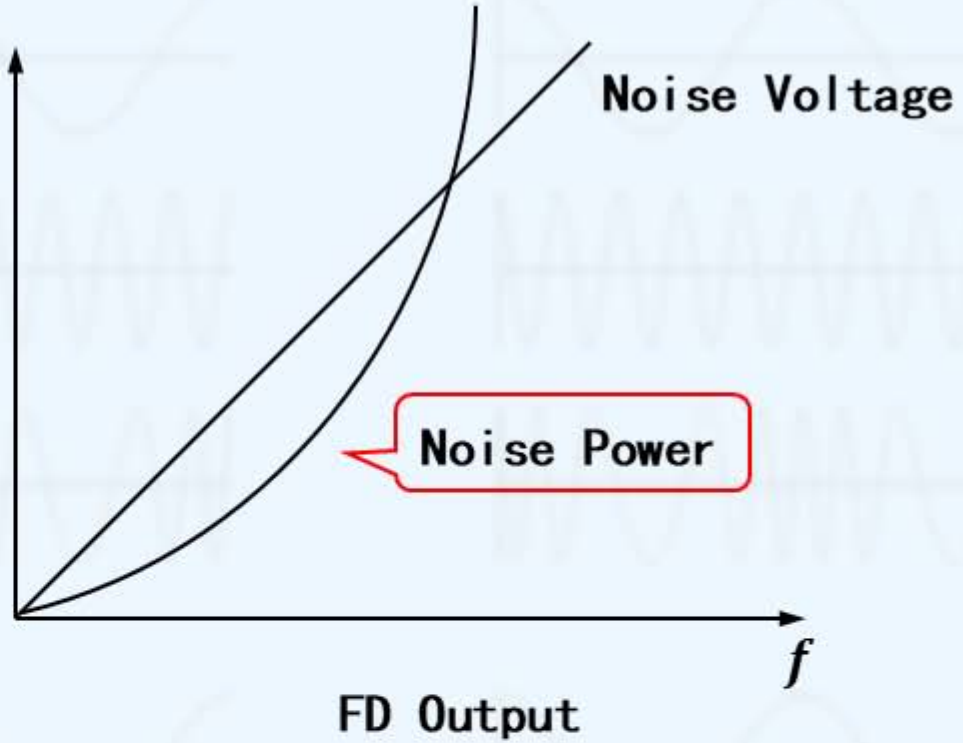
Example: FM radio superior to AM Radio

Analysis of FM Reliability

- B ~ SNR $C = B\log_2(1+\frac{S}{N})$
- Question: FM Bandwidth ↑, Noise ↑ , FM $\frac{S_o}{N_o}$ ↑ ?
- Reason:
  - (1) FM side frequencies are correlative
  - (2) Noise is independent

FM Emphasis

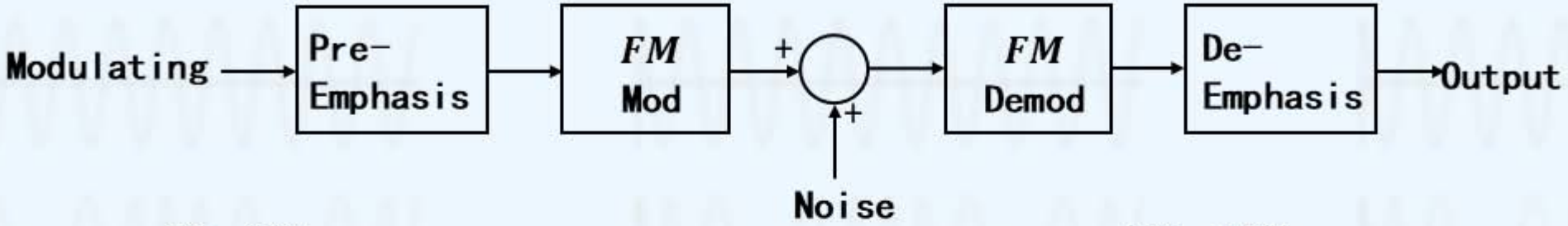
- Issue: $\frac{S_o}{N_o}$ |high frequency ↓



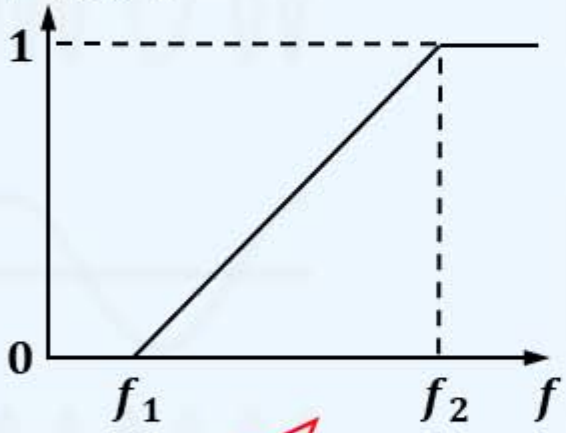
- Reason: Frequency Discrimination (FD) output $N_o \propto f^3$

- Solution: Emphasis

FM (Pre-Emphasis vs. De-Emphasis)



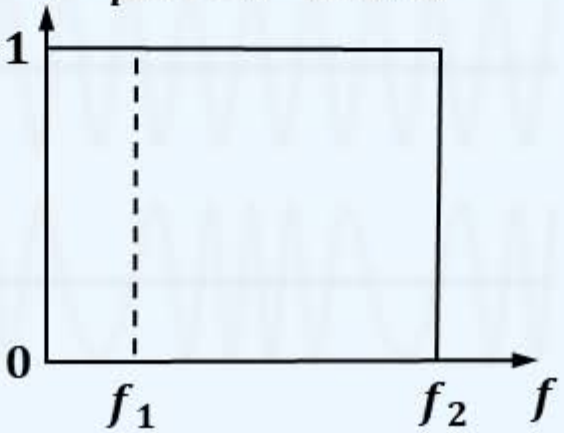
$|H_{pe}(f)|$



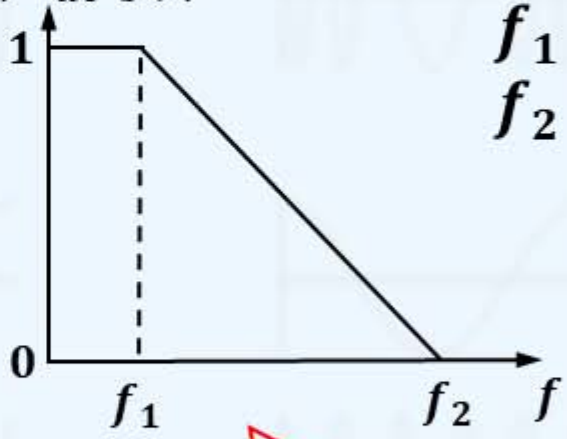
"Pre-Emphasis" :
RF signal ↑

For singal

$|H_{pe}(f)||H_{de}(f)|$



$|H_{de}(f)|$



$f_1 = 2.1kHz$
$f_2 = 15kHz$

"De-Emphasis" :
RF noise ↓
RF signal ↓