

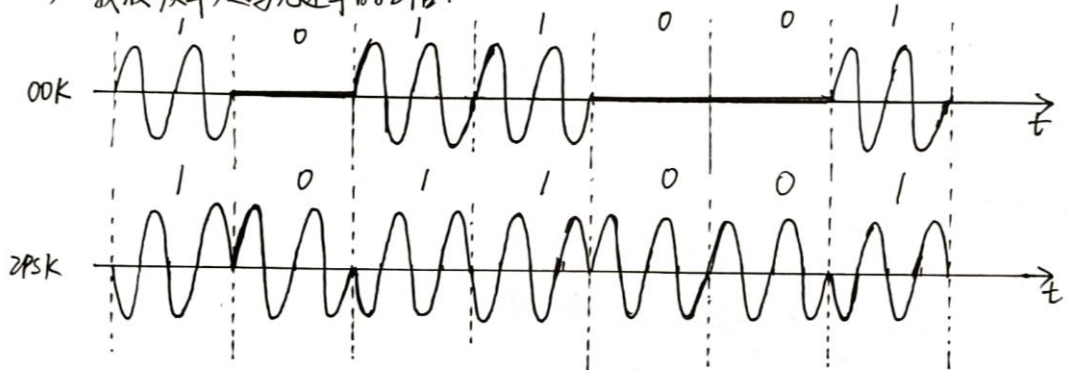
通信原理第 7 章作业

7-1 解: (1) 载波频率 $f = \frac{8\pi \times 10^3}{2\pi} = 4000 \text{ Hz}$.

码元速率 $R_B = 2000 \text{ Baud}$

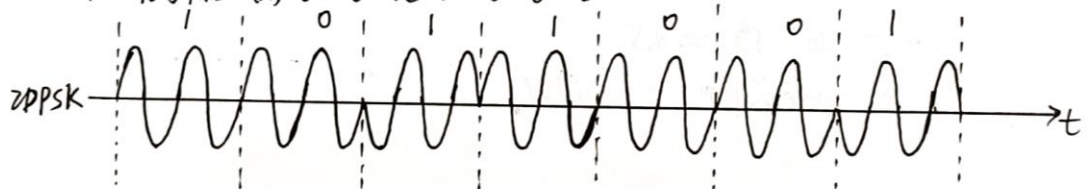
每个码元包含的载波周期: $\frac{4000}{2000} = 2$ 个

(2) 载波频率是码元速率的 2 倍.



二进制数字信号: 1 0 1 1 0 0 1

2PSK 信号相位: $(\pi) 0 0 \pi 0 0 \pi$



特点: OOK 中载波在二进制基带信号控制下通—断变化, 某种符号(0或1)用有没有电压表示
 2PSK 中 发送 0 时信号取 0 相位, 发送 1 时取 π 相位
 2DPSK 中 载波的相位遇到 "1" 变化 π , 遇到 "0" 不变.

(3) $B_{2PSK} = B_{2DPSK} = B_{2ASK} = 2R_B = 2 \times 2000 = 4000 \text{ Hz}$.

7-10 解: 相干系统:

(1) 2ASK: 误码率 $P_e = \frac{1}{2} \operatorname{erfc} \frac{\sqrt{r}}{2} = 10^{-4}$

得解调器输入信噪比 $r = \frac{S}{N} = \frac{a^2}{2G_n^2} = 28$

解调器输入端噪声功率: $N = G_n^2 = n_0 B_{2ASK} = n_0 \cdot 2R_B = 8 \times 10^{-10} \text{ W}$

\therefore 输入信号功率 $S = rN = 28 \times 8 \times 10^{-10} = 224 \times 10^{-8} \text{ W}$

2FSK: $P_e = \frac{1}{2} \operatorname{erfc} \sqrt{\frac{r}{2}} = 10^{-4}$ 得 $r \approx 14$

$S = rG_n^2 = 14 \times 8 \times 10^{-10} = 112 \times 10^{-8} \text{ W}$

2PSK: $P_e = \frac{1}{2} \operatorname{erfc} \sqrt{r} = 10^{-4}$ 得 $r \approx 7$

$S = rG_n^2 = 7 \times 8 \times 10^{-10} = 56 \times 10^{-9} \text{ W}$

2DPSK: $P_e = \operatorname{erfc} \sqrt{r} = 10^{-4}$ 得 $r \approx 7.62$

$S = rG_n^2 = 7.62 \times 8 \times 10^{-10} = 61 \times 10^{-8} \text{ W}$

(2) 非相干系统

2ASK: $P_e = \frac{1}{2} e^{-\frac{r}{2}} = 10^{-4}$ 得 $r \approx 34$

$S = rG_n^2 = 34 \times 8 \times 10^{-10} = 272 \times 10^{-8} \text{ W}$

2FSK: $P_e = \frac{1}{2} e^{-\frac{r}{2}} = 10^{-4}$ 得 $r \approx 17$

$S = rG_n^2 = 17 \times 8 \times 10^{-10} = 136 \times 10^{-8} \text{ W}$

2DPSK: $P_e = \frac{1}{2} e^{-r} = 10^{-4}$ 得 $r \approx 8.5$

$S = rG_n^2 = 8.5 \times 8 \times 10^{-10} = 68 \times 10^{-9} \text{ W}$

7-16 解: (1) 2PSK 主频率带宽: $B_{2PSK} = 2R_B = 4800 \text{ Hz}$

频带利用率 $\eta_0 = \frac{R_b}{B} = \frac{1}{2} \log_2 M = \frac{1}{2} (6/\text{Hz})$

(2) 带宽 $B = (1+\alpha)R_B = 1.4 \times 2400 = 3360 \text{ Hz}$

频带利用率 $\eta_0 = \frac{R_b}{B} = \frac{2400}{3360} \approx 0.71 (\text{b/(sHz)})$

(3) $\eta_0 = \frac{R_b}{B} = \frac{7200}{3360} = 2.13 = \frac{\log_2 M}{1+\alpha}$

$\therefore M = 8$

调制式可用 8PSK.