知识点Z4.40

案例：二次抑制载波振幅调制接收系统

主要内容：

二次抑制载波振幅调制接收系统

基本要求：

了解二次抑制载波振幅调制接收系统的基本原理

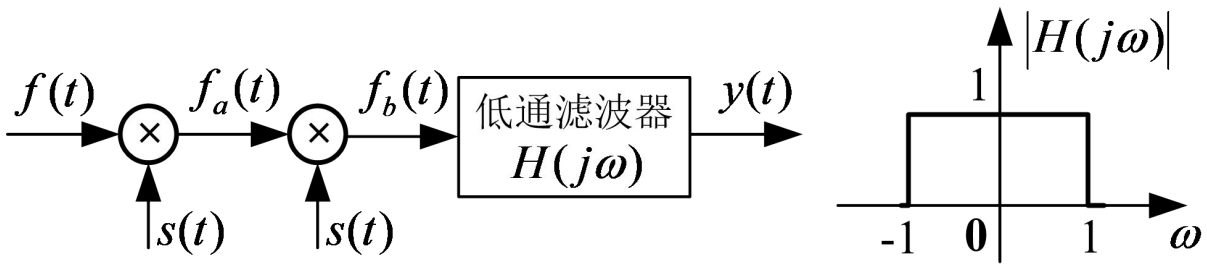
Z4.40* 案例：二次抑制载波振幅调制接收系统

例：如图二次抑制载波振幅调制接收系统，已知

输入信号：$f(t)=\dfrac{\sin t}{\pi t},-\infty<t<\infty$

调制信号：$s(t)=\cos 500t,-\infty<t<\infty$

问：输出信号$y(t)$=?



解：$y(t)=f(t)\times s(t)\times s(t)*h(t)$

$$Y(j\omega)=\{\frac{1}{2\pi}[\frac{1}{2\pi}F(j\omega)*S(j\omega)]*S(j\omega)\}\bullet H(j\omega)$$

$$g_2(t) \leftrightarrow 2Sa(\omega)$$

由对称性可知：

$$2Sa(t) \leftrightarrow 2\pi g_2(-\omega) = 2\pi g_2(\omega)$$

$$\frac{\sin t}{\pi t} = \frac{Sa(t)}{\pi} = f(t) \leftrightarrow g_2(\omega)$$

所以：$F(j\omega) = g_2(\omega)$

调制信号：$s(t) = \cos 500t, -\infty < t < \infty$

$$S(j\omega) = \pi[\delta(\omega+500) + \delta(\omega-500)]$$

$$Y(j\omega)=\{\frac{1}{2\pi}[\frac{1}{2\pi}F(j\omega)*S(j\omega)]*S(j\omega)\}\bullet H(j\omega)$$

$$=\frac{1}{4\pi^2}g_2(\omega)*\pi[\delta(\omega+500)+\delta(\omega-500)]*\pi[\delta(\omega+500)+\delta(\omega-500)]\bullet H(j\omega)$$

$$=\frac{1}{4\pi^2}g_2(\omega)*\pi^2[\delta(\omega+1000)+2\delta(\omega)+\delta(\omega-1000)]\bullet H(j\omega)$$

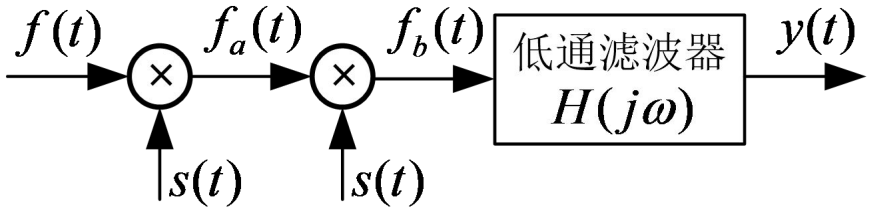
$$=\frac{1}{4\pi^2}g_2(\omega)*\pi^2[\delta(\omega+1000)+2\delta(\omega)+\delta(\omega-1000)]\bullet H(j\omega)$$

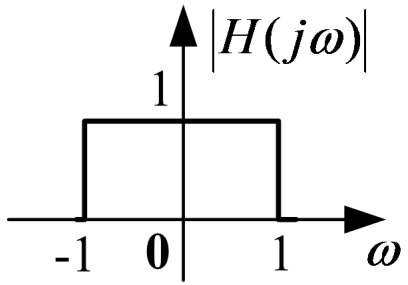
$$=\frac{1}{4}g_2(\omega)*[\delta(\omega+1000)+2\delta(\omega)+\delta(\omega-1000)]\bullet g_2(\omega)$$

$$=\frac{1}{2}g_2(\omega)$$

所以：

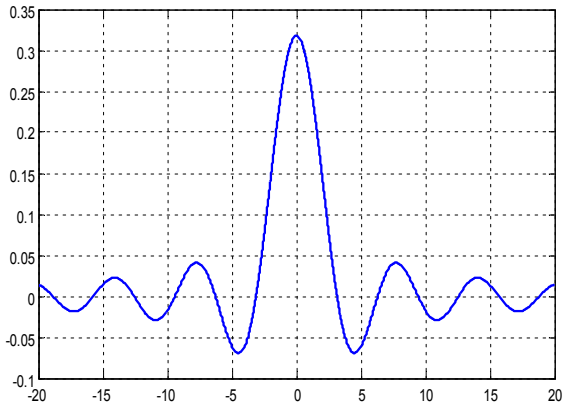
$$y(t)=\frac{\sin t}{2\pi t}=\frac{Sa(t)}{2\pi}=\frac{1}{2}f(t)$$



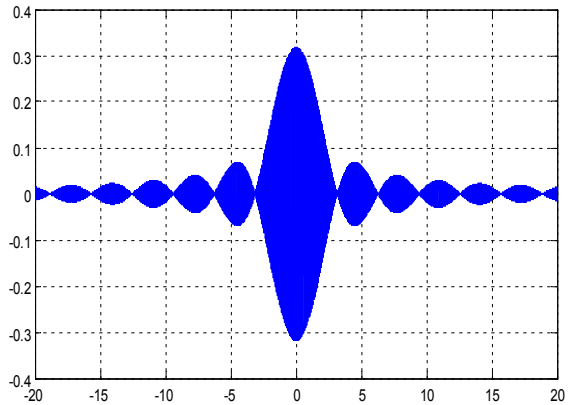


$$\varphi(\omega)=0$$

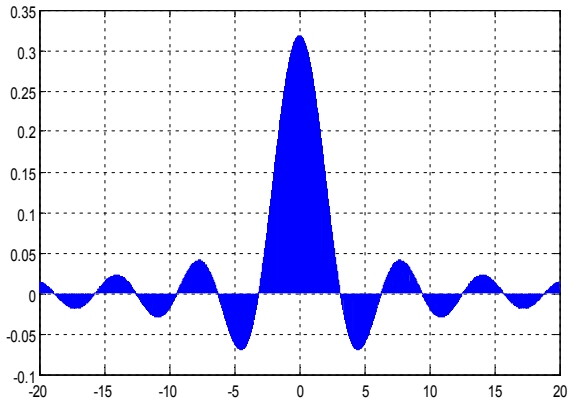
$f(t)$



$f_a(t)$



$f_b(t)$



思考：各信号的频谱图？

为更清楚展示原理，
取s(t)=cos(10t)