

$$m(t) = 2 \cos(4000\pi t) + 5 \cos(6000\pi t)$$

$$c(t) = 100 \cos(2\pi f_c t), \quad f_c = 50 \text{ kHz}$$

Sketch the PSD of PSB-SC?

$$s(t) = c(t) m(t)$$

$$= 100 (2 \cos(2\pi(2000)t) + 5 \cos(2\pi(3000)t))$$

$$= 200 \cos(2\pi(2000)t) \cos(2\pi f_c t) + 500 \cos(2\pi(3000)t) \cos(2\pi f_c t)$$

$$= 100 \cos(2\pi(4800)t) + 100 \cos(2\pi(5200)t) + 250 \cos(2\pi(4700)t) + 250 \cos(2\pi(5300)t)$$

$$\downarrow f$$

$$S(f) = 50 \delta(f - 48000) + 50 \delta(f + 48000) + 50 \delta(f - 52000) + 50 \delta(f + 52000) + 125 \delta(f - 47000) + 125 \delta(f + 47000) + 125 \delta(f - 53000) + 125 \delta(f + 53000)$$



$$m(t) = 2 \cos(4000t) + 4 \sin(5000t + \frac{\pi}{3})$$

$$c(t) = A \cos(8000\pi t)$$

sketch PSD of $s(t)$ using DSB-SC?

$$s(t) = m(t)c(t)$$

$$s(t) = \left[2 \cos\left(2\pi\left(\frac{2000}{\pi}\right)t\right) + 4 \sin\left(2\pi\left(\frac{2500}{\pi}\right)t + \frac{\pi}{3}\right) \right] A \cos(2\pi(4000)t)$$

$$= 2A \cos\left(2\pi\left(\frac{2000}{\pi}\right)t\right) \cos(2\pi(4000)t) + 4A \sin\left(2\pi\left(\frac{2500}{\pi}\right)t + \frac{\pi}{3}\right) \cos(2\pi(4000)t)$$

1st way then trig identity

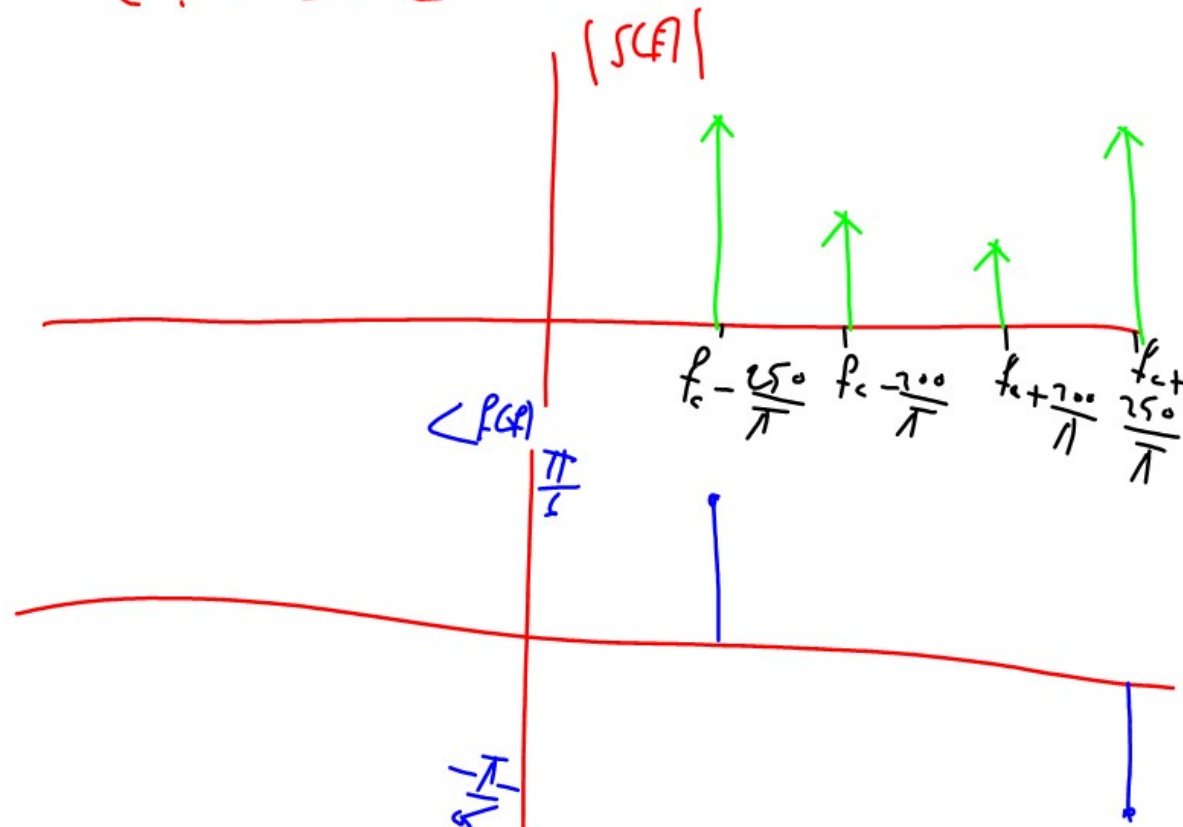
2nd way

$$\left[\delta\left(f - \frac{2000}{\pi}\right) + \delta\left(f + \frac{2000}{\pi}\right) + \frac{2}{j} e^{j\frac{\pi}{3}} \delta\left(f - \frac{2500}{\pi}\right) - \frac{2}{j} e^{-j\frac{\pi}{3}} \delta\left(f + \frac{2500}{\pi}\right) \right] * \frac{A}{2} [\delta(f - 4000) + \delta(f + 4000)]$$

$$= \frac{A}{2} \left[\delta\left(f - 4000 - \frac{2000}{\pi}\right) + \delta\left(f - 4000 + \frac{2000}{\pi}\right) + 2e^{-j\frac{\pi}{6}} \delta\left(f - 4000 - \frac{2500}{\pi}\right) + 2e^{j\frac{\pi}{6}} \delta\left(f - 4000 + \frac{2500}{\pi}\right) + \delta\left(f + 4000 - \frac{2000}{\pi}\right) + \delta\left(f + 4000 + \frac{2000}{\pi}\right) + 2e^{-j\frac{\pi}{6}} \delta\left(f + 4000 - \frac{2500}{\pi}\right) + 2e^{j\frac{\pi}{6}} \delta\left(f + 4000 + \frac{2500}{\pi}\right) \right]$$

$$j = e^{j\frac{\pi}{2}}, \quad -j = e^{-j\frac{\pi}{2}}$$

$$e^{-j\frac{\pi}{6}} e^{j\frac{\pi}{3}} = e^{j\frac{\pi}{6}} = e^{j\frac{\pi}{2} - \frac{\pi}{3}} = e^{-j\frac{\pi}{6}}$$



AM-LC

find η ?

Carrier power?

Signal power?

eff?

3 / 3

