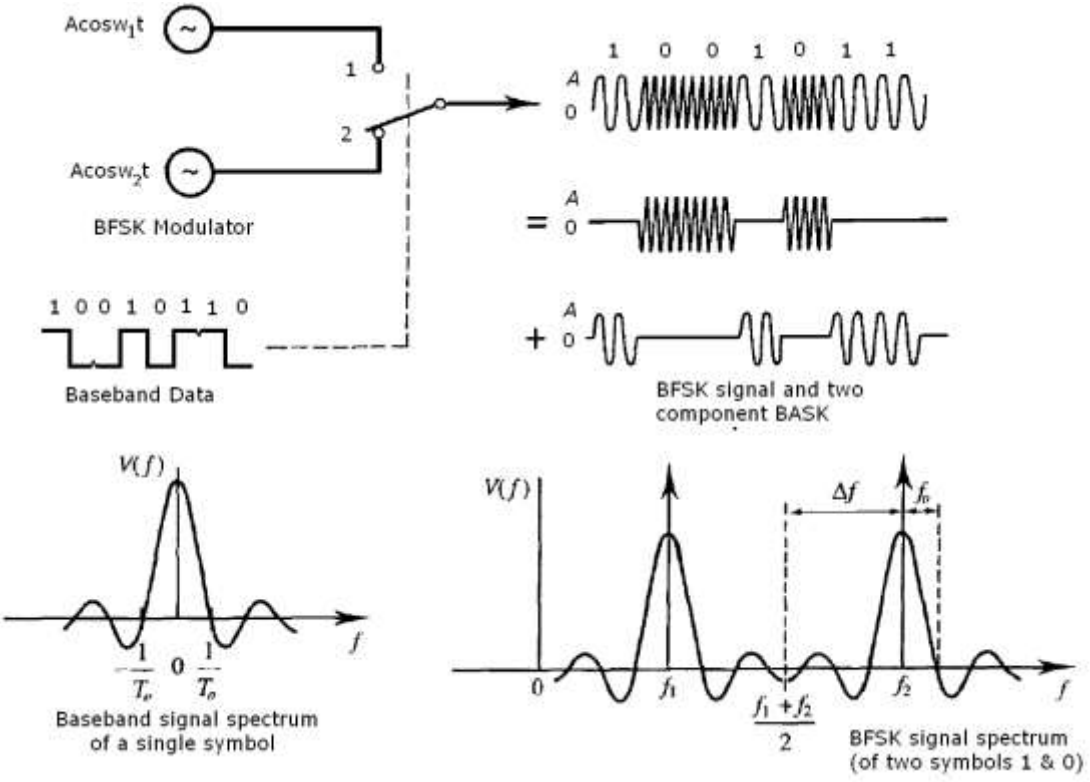
2.3 BINARY FREQUENCY SHIFT KEYING (BFSK)

In BFSK, the instantaneous frequency of the carrier is switched between two values in response to the binary code. We can consider the BFSK waveform as a composition of two BASK waveforms of different carrier frequencies.

$$x(t) = \begin{cases} A\cos(\omega_1 t) & \text{for logic 1} \\ A\cos(\omega_2 t) & \text{for logic 0} \end{cases}$$



2.3.1 Generation

As shown above, a BFSK carrier frequency is:

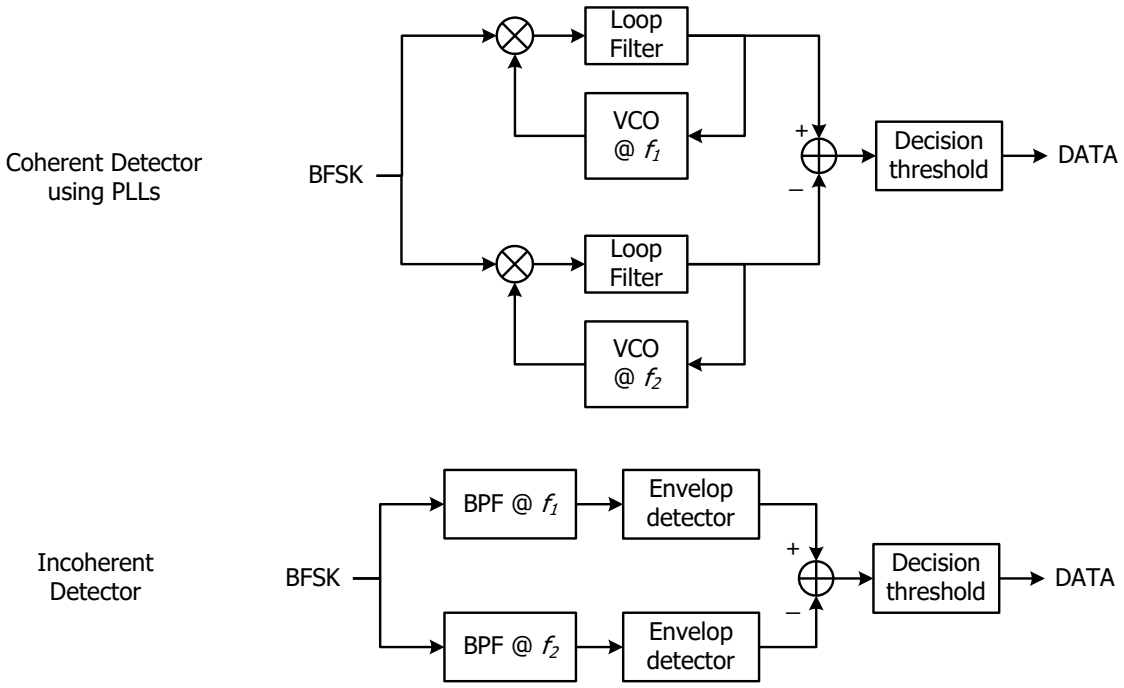
$$f_c = \frac{f_1 + f_2}{2}$$

And the BFSK frequency deviation is:

$$\Delta_f = \frac{f_2 - f_1}{2}$$

To define the bandwidth of a BFSK signal, we'll consider the bandwidth ends at the first zero crossing point in the BFSK spectrum. So, $B = 2\Delta_f + 2R_b$, where $R_b = 1/T_0 =$ the baud rate of the baseband data stream, which is assumed here to be the nominal bandwidth of the binary.

2.3.2 Demodulation



2.3.3 Probability of Error in BFSK

$$P_E = \text{Erfc}\left(\sqrt{\frac{E_{\text{Avg}}}{\eta}}\right)$$

As $E_{AV} = \dfrac{(E_0 + E_1)}{2} = \dfrac{2E_1}{2} = E_1 = E_0$

$$P_E = \text{Erfc}\left(\sqrt{\frac{E_1}{\eta}}\right)$$

$$P_E = \text{Erfc}\left(\sqrt{\frac{S}{N}}\right) \quad \text{Coherent Detection at } T_0 B = 1$$

$$P_E \approx \frac{1}{2}\exp\left(\frac{-E_{AV}}{2\eta}\right) \quad \text{Incoherent Detection}$$

It seems just like the BASK results, is there any difference?