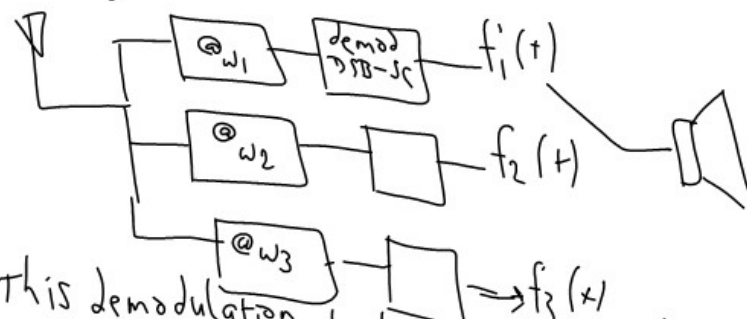


How could we select one channel from FDM signals?

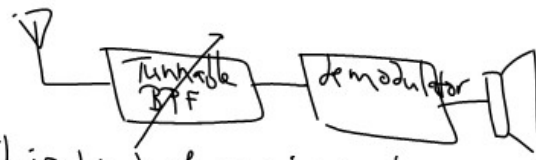
* We can separate signals in FDM by using one of the following methods

1. using filter bank as shown below



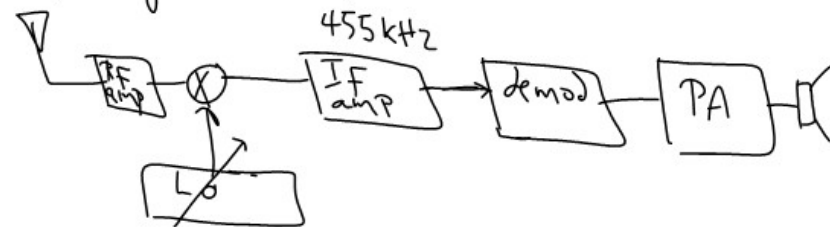
* This demodulation technique is suitable only for ADSL system but not suitable for commercial radio systems because of the large hardware

2. using one tunable BPF followed by a single demodulator as shown below



This kind of receiver has a selectivity and sensitivity problem

3. Superheterodyne receiver



* The principle of operation of the superheterodyne receiver is that when a given signal is to be received its frequency is down converted from the RF range into the intermediate range (IF range)

* The process of down frequency conversion can be performed by multiplying the RF signal by the local oscillator signal

* at the multiplier (mixer) output there will be two signals whose frequencies are given by

$f_{LO} + f_{RF} \rightarrow$ Cancelled by the IF filter

$f_{LO} - f_{RF} = f_{IF} \rightarrow$ Pass through the IF filter

* To choose one of the channel the local oscillator frequency f_{LO} must be selected according to

$$f_{LO} = f_{RF} + f_{IF}$$

Ex a superheterodyne receiver is designed to receive a signal broadcasting at an RF equal to $f_{RF} = 600 \text{ kHz}$. Determine the value of f_{LO} ?

Solution

$$f_{LO} = f_{RF} + f_{IF} \\ = 600 + 455 \text{ kHz} = 1055 \text{ kHz}$$

* The IF in AM and FM systems are $f_{IF} = 455 \text{ kHz}$ AM
 $= 10.7 \text{ MHz}$ FM system