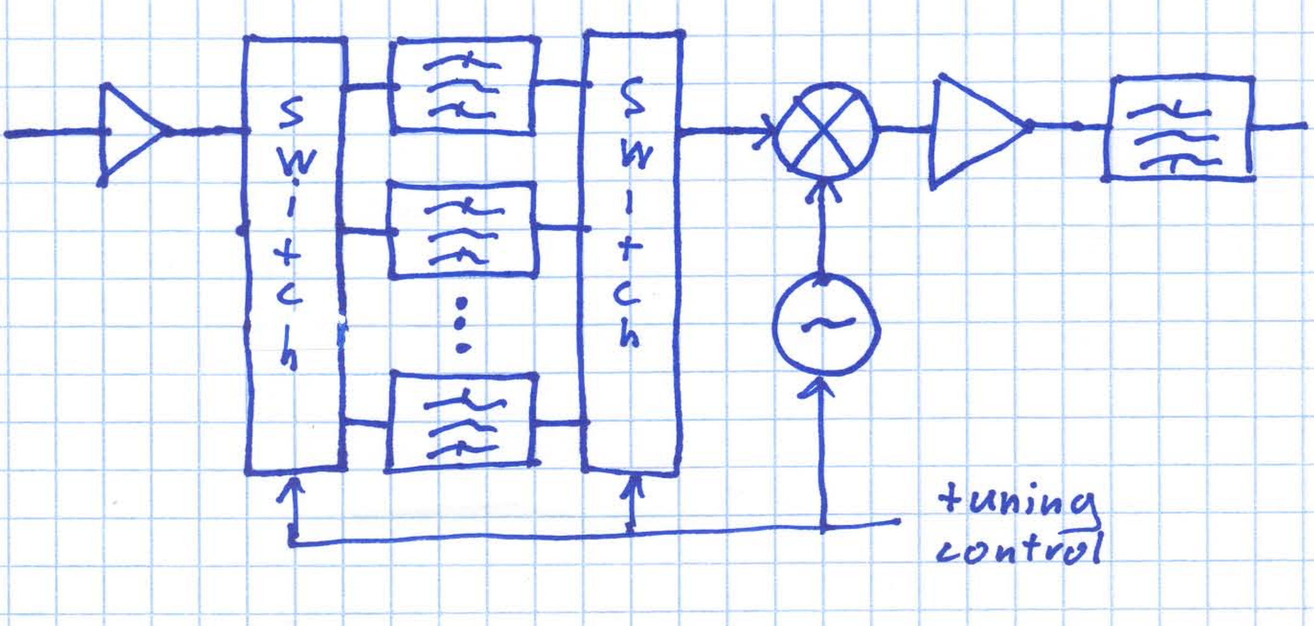
Advanced Rx Designs

To acheive *exceptional* image/3rd-order product rejection, Rx designers can employ these advanced receiver architectures:

Selectable Preselection

Instead of using a single preselector filter, we can use a *bank* of selectable preselector filters:



In other words, we use <u>multiple</u> preselector filters to span the Rx band width.

For <u>example</u>, say the Rx bandwidth is 8-12 GHz. Instead of one filter with a 3dB bandwidth of 8 to 12 GHz, we might use <u>4</u> filters, with bands:

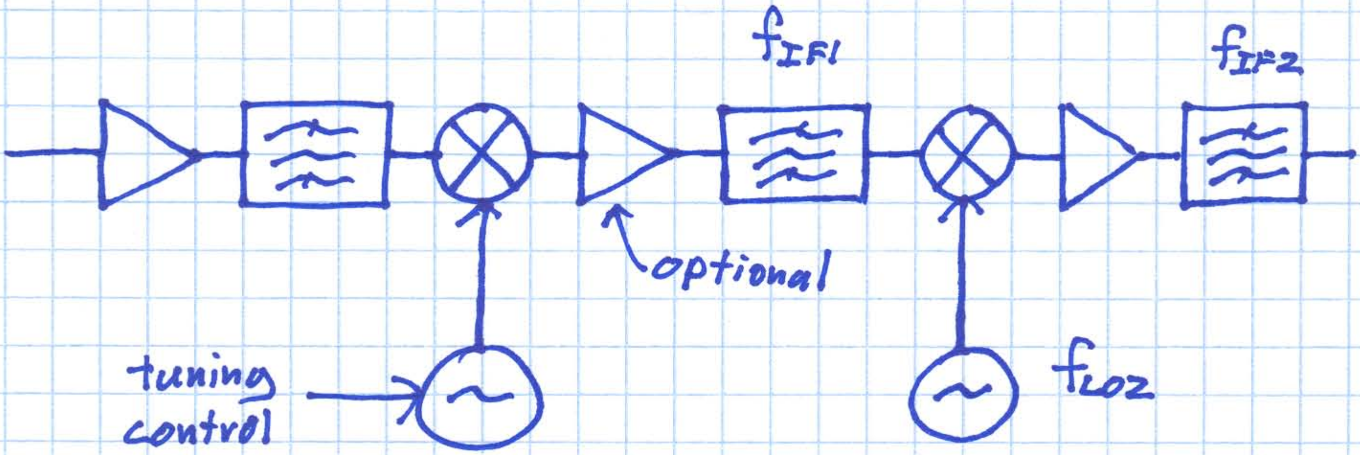
	bandwidth
filter #1	8-9 GHz
filter #2	9-10 GHz
filter #3	10-11 GHz
filter #4	11-12 GHz

Thus, if we <u>tune</u> the receiver (i.e., the local oscilator) to an RF frequency of <u>10.3</u> GHz, we would set the switches so that filter <u>3</u> is selected.

This design is particularly effective when the receiver has a wide bandwidth.

Dual Conversion Receivers

Another advanced design is the dual-conversion receiver. With this concept, we employ 2 Intermediate Frequencies!



The idea behind this receiver is that the image/3rd-order rejection generally improves as we increase the IF frequency. It will really get good if we make the IF frequency much higher than the RF frequencies! For example, we might use an IF of <u>8 GHz</u> for a Rx with RF bandwidth of <u>1-2</u> GHz!

Note that the <u>LO</u> bandwidth for this design would be either:

6 - 7 GHz or 9 - 10 GHz

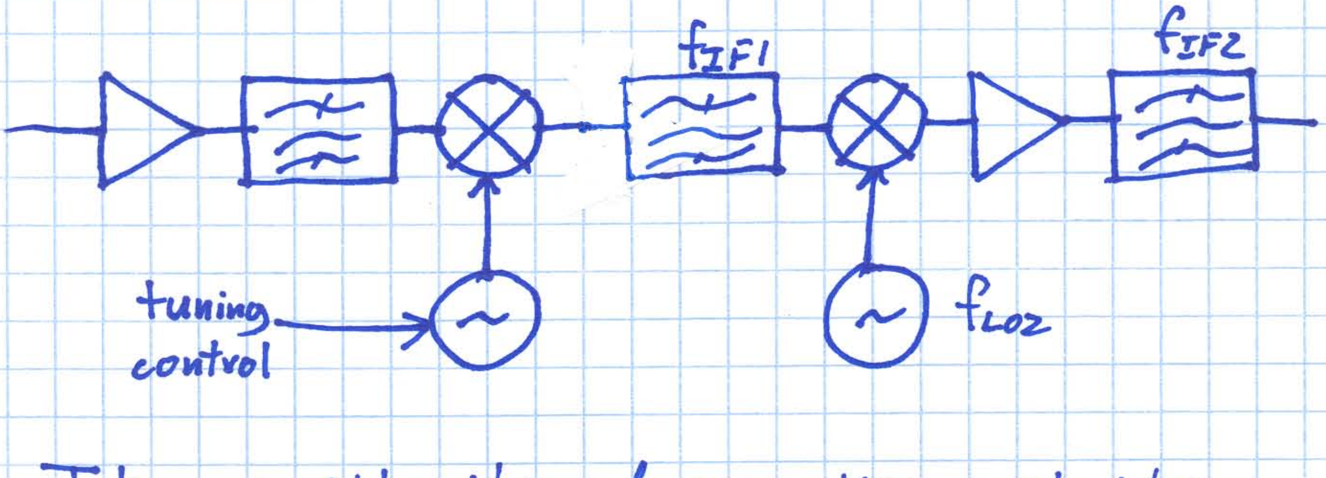
where for the first case we use the product $f_{IF} = f_{RF} + f_{LO}$, and for the second case we use $f_{IF} = f_{LO} - f_{RF}$.

Q: O.K., I see why using an extremely high IF <u>could</u> provide excellent image rejection. But, wouldn't amplifiers/attenuators at 8 GHz (say) and a demodulator at 8 GHz be <u>very</u> expensive and/or perform <u>poorly</u>?!?

A: True! This is why we employ a second IF!

We down convert our signal at the first IF to a "normal" IF frequency (e.g. 100 MHz).
Note the local oscillator for this second mixer is at a fixed frequency:

$$f_{LO2} = \left| f_{IF1} - f_{IF2} \right|$$



Thus, with this design, we get the rejection associated with a high frequency IF, while retaining the cost/performance of the AGC and demodulator associated with a low IF.