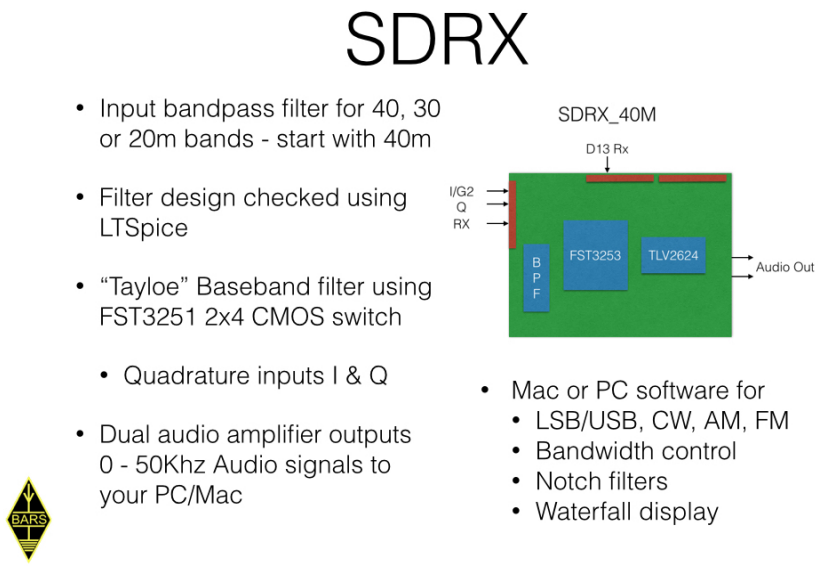
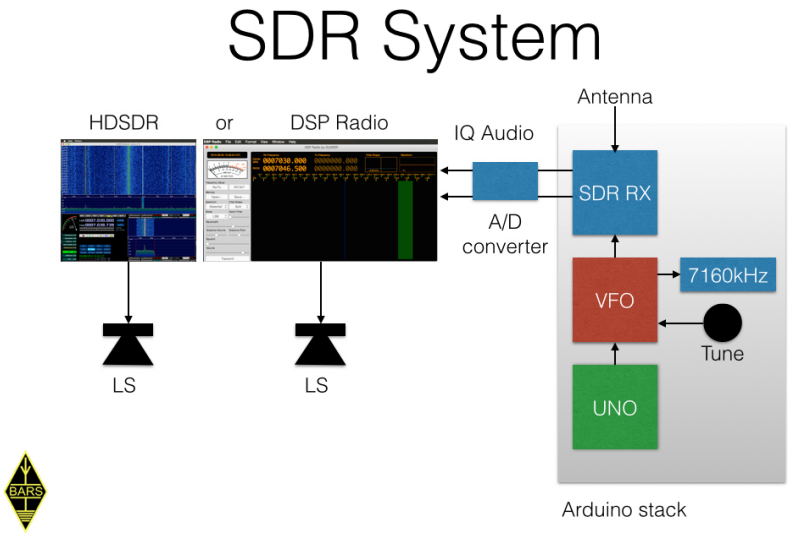
**Concept Session 6 - SDR Design**
**Course Notes**

The SDR is designed for use on 40m. This is determined only by the choice of components for the input Band Pass Filter, and other bands are possible.




The shield is made up of three blocks, the BPF, the FST3253 Baseband filter and the TVL2462 amplifier. The input is on the RFbus which also carries the quadrature IQ signals. The IQ outputs go the the DAC/soundcard and your computer.




An SDR receiver system feeds the Shield output through a DAC to the SDR program running on your PC or Mac. The output of the SDR program goes to the internal or an external LS. The two programs tested have been the Windows program HDSDR and the Mac program DSP Radio.

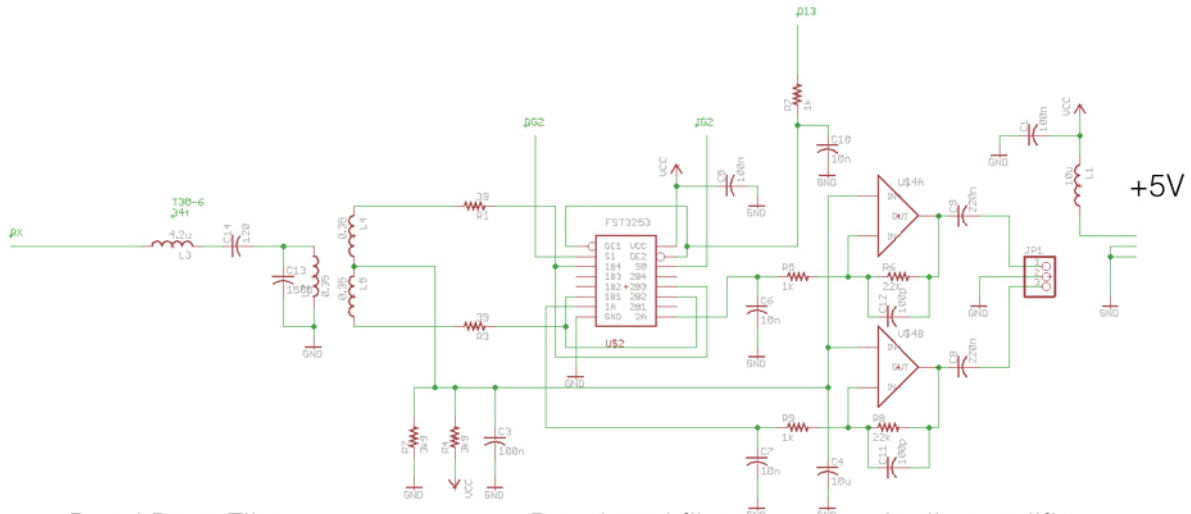
# Good “sound card”

- A sound card is a D-to-A and A-to-D converter
- The best are 96kHz/16 - 24bit devices (+/-48kHz RX BW)
- If your PC does not have a good sound card, use an external USB one
- Like this product from StarTech. Available on Amazon
- Can also be used for TX


From SDR RX

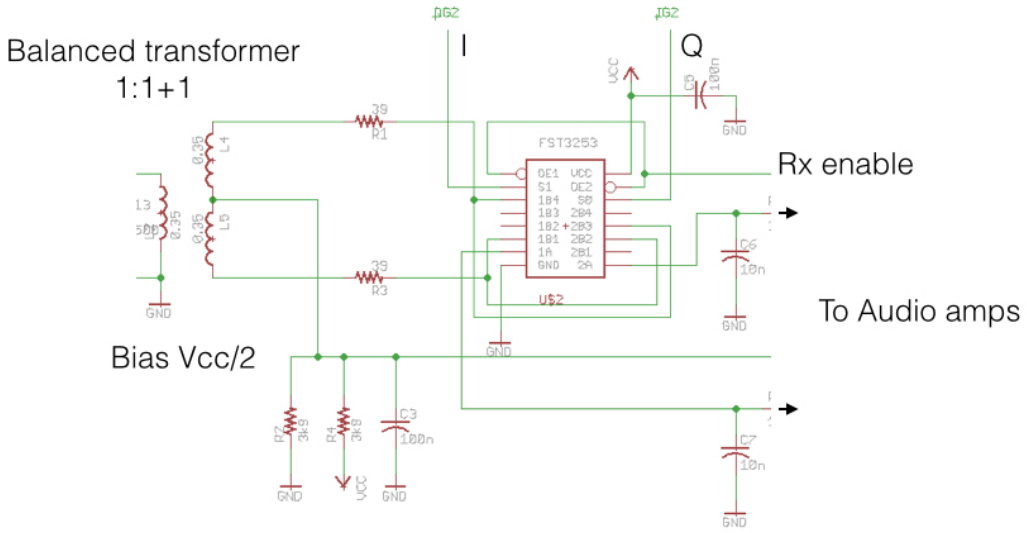
It is essential that you have a good soundcard or DAC. The bandwidth of the DACs can very, but the tuning range display on your SDR program will be +/- half of the DAC bandwidth. So to get a reasonable display of +/-48kHz each side of centre a 96kHz DAC is needed. Very often PCs do not have such wide band DACs, so an external USB one would be suitable.

# Schematic




The complete schematic shows three distinct parts of the design. The first is the BPF, designed as serial and parallel resonant circuits. The component values were chosen and the response check using LTSpice circuit simulator.

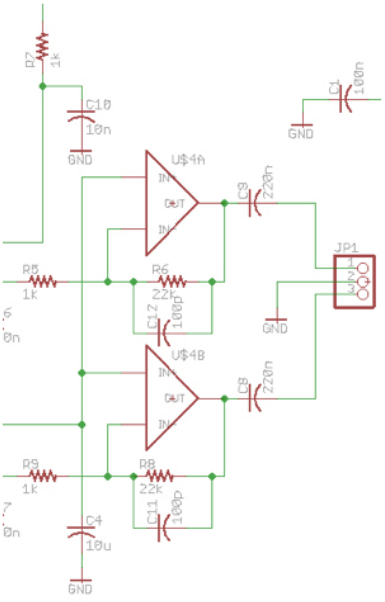
# Baseband filter




The Baseband filter or mixer uses the CMOS FST3253 2 x 4 channel CMOS switch. This has an internal decoder that can be fed by quadrature signals to commutate the switches. The circuit is enabled by a low signal on Rx Enable, coming from the Arduino D13 output. The circuit is biased to half supply and this also feeds the output amplifiers. The input RF is switched to the two capacitors connected to the output ‘audio’ amplifiers.

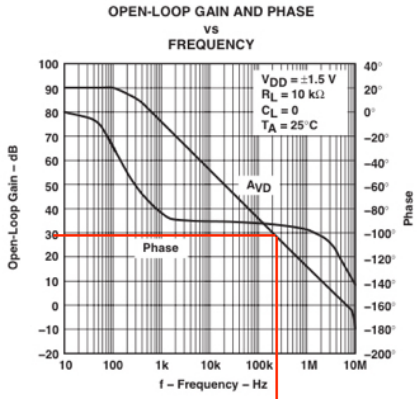
The input impedance is 50R set by the 39R series resistors and the 10R resistance of the CMOS switches.

# IQ Audio Amp




2.5V bias

Gain = 22/1 = 27dB




BW ~ 220kHz

So 96kHz easily covered

BW ~100kHz by C11, C12 = 100pF

The output amplifiers have a gain of 27dB. and their bandwidth is limited by 100p capacitors in the feedback loop.

The whole SDR design is as simple as possible, and thus does not have extreme performance, but it serves its purpose of introducing amateurs to the SDR receive technique. Many find that when they have used an SDR with its wide band display of transmissions they never want to go back to a conventional single frequency at-a-time receiver