1. Greenbank
   1. The mechanism for the emission that we observed from the Milky Way disk was the 21-cm emission line of hydrogen, as well as the doppler shift mechanism. This emission line from the hyperfine transition of the hydrogen 1s ground state. It is called the spin-flip transition because this 21-cm photon is released when the proton-electron pair flips from the higher-energy parallel spins to the lower-energy anti-parallel spins.
   2. The 21-cm hydrogen emission line described previously corresponds to a vacuum frequency of 1.42GHz. However, the equipment that eventually connects to the Chart Recorder cannot measure such high frequencies, it can only measure frequencies of a few hundred MHz. Instead, we must mix the signal with a constant signal at 1.32 GHz, lowering the 1.42GHz frequency to about 100MHz. If our goal is to measure the doppler distribution of the Milky Way spectrum, we must measure the sky in multiple frequencies. This is done by modulating the Local Oscillator (LO) frequency to our desired frequency (minus 100MHz, remember the mixer), and slowly changing the frequency within our desired range. This will plot on the chart recorder the intensity vs. wavelength of the Milky Way disk.
2. CCDs
   1. Using an insulator would make the bandgap between the conduction and valence bands too wide to traverse for a detection electron. Making it too difficult to detect any hits. Using a conductor would cause an overlap between the conduction and valence bands, making the instrument to sensitive to reliably collect data.