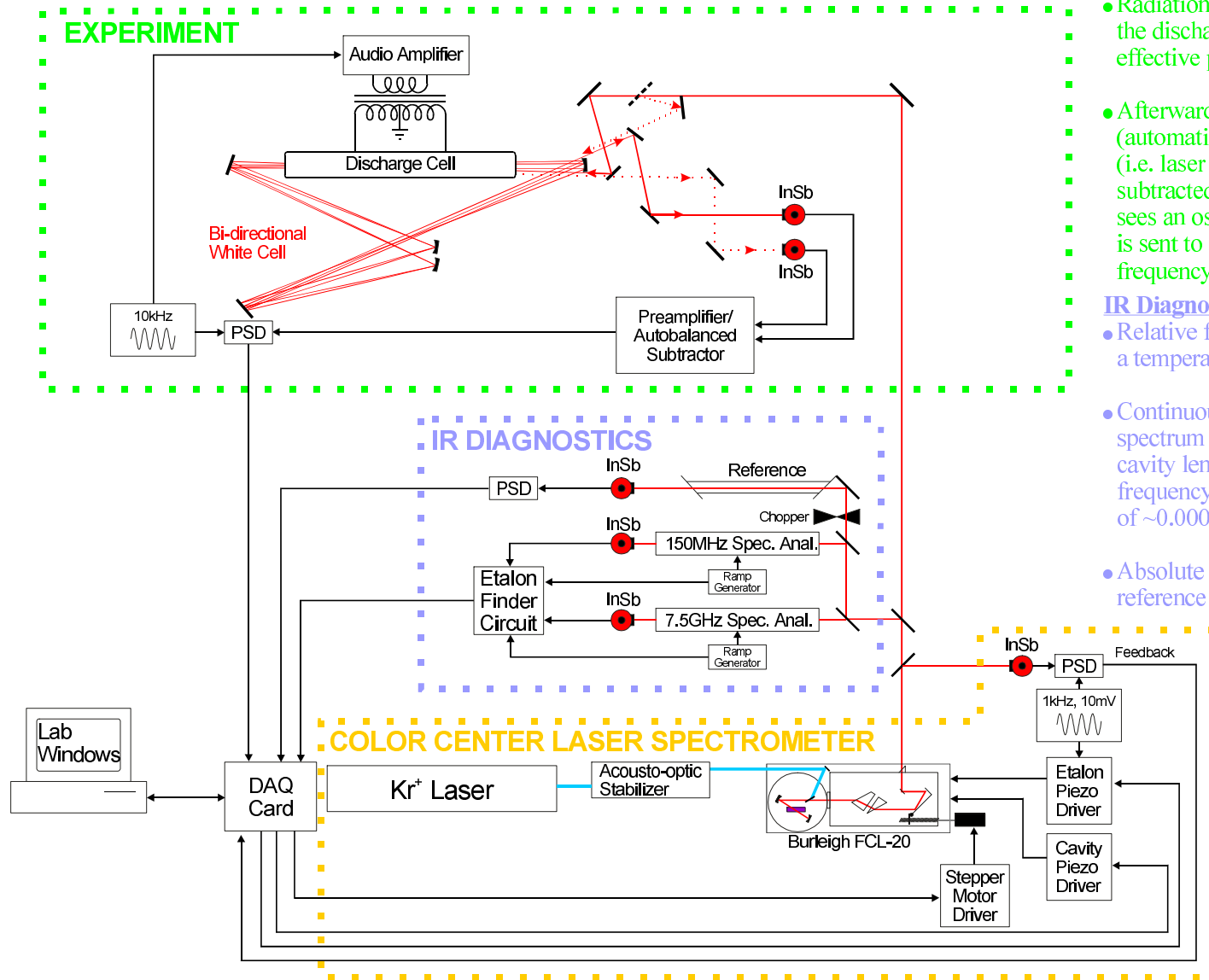


The Oka Ion Factory™ Color Center Laser Spectrometer



Experiment:

- Radiation is split into two channels, and each is sent through the discharge tube 4 times in opposite directions for an effective path length of ~10 m.
- Afterwards, the channels are balanced and then subtracted (automatically with a home-built circuit): Common signals (i.e. laser and plasma noise and neutral absorptions) are subtracted out while the two ion signals add (each channel sees an oscillating signal but at opposite phase). This signal is sent to a PSD for lock in detection at the discharge frequency. Fractional absorptions $\sim 5 \times 10^{-7}$ are detectable.

IR Diagnostics:

- Relative frequency calibration achieved with a 7.5 GHz and a temperature stabilized 150MHz scanning etalons..
- Continuous tracking (using the etalon finder circuit) of spectrum analyzer transmission as a function of etalon cavity length allows for precision measurement of laser frequency at every datapoint, Relative frequency accuracies of $\sim 0.0001 \text{ cm}^{-1}$ are possible.
- Absolute frequency calibration supplied by a variety of reference gases.

Color Center Laser Spectrometer:

- Continuously tunable from $2900\text{--}4200 \text{ cm}^{-1}$.
- Power ranges from 5 - 20 mW, depending on frequency region.
- A computer scans the tuning elements while maintaining single mode locking as well as data acquisition.
- Scans $\sim 10 \text{ cm}^{-1}$ per hour at a resolution of 0.0005 cm^{-1} .