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NOBLE GAS MASS SPECTROMETRY

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This work was dedicated to studying the Helix MC mass spectrometer and to prepare it for experimental use. The Helix was purchased in order to measure the relative isotope abundances of noble gases contained within stardust and meteor samples. The lab is interested in noble gases because of their non-reactive nature; their inertness means that their current abundances in samples give insights billions of years into the past. For example, ^{40}K decays into ^{40}Ar , so measuring the ratio between ^{36}Ar , a trapped component, and ^{40}Ar , an *in situ* component allows researchers to determine a sample's age. The Helix specializes in precise measurements of the light noble gases Helium and Neon and was purchased primarily in order to establish a standard ^{20}Ne : ^{22}Ne ratio for solar wind.

In order to prepare the Helix for experimental use, the electron impact ion source needed to be tuned to achieve ideal measurements. To accomplish this, samples of gas that contained known atmospheric noble gas abundances were admitted into the spectrometer, and these measurements were used to tune the ions source to achieve ideal peak shape. Once ideal peak shape was achieved, the multi-collectors were repositioned in order to measure up to five isotopes simultaneously. Unfortunately, the summer ended before the system was ready to measure actual samples, but the Helix is significantly closer to being experiment-ready due to these tuning efforts.