300 AMU Gas Analyzer Operation Recommendations

Stanford Research Systems 300 AMU gas analyzers are high performance mass spectrometers, which rely on a high frequency powered quadrupole filter to separate ions based on their mass-to-charge ratio. As in any quadrupole based analyzer, the amplitude of the RF required to select a specific gas is proportional to the mass-to-charge ratio of the selected ion, the diameter of the rods used in the filter and the RF frequency. All SRS gas analyzer models share the same quadruople probe design and operate at the same frequency of 2.75 MHz. As a result, all models offer the same sensitivity and resolution at all masses. However, the very high RF frequency and voltage required in 300 amu units to filter heavy ions necessitates some special warm up and operation considerations.

The RF voltage delivered to the quadruople rods is passed through a transformer, which is part of a LC tank circuit that is carefully tuned to the oscillation frequency of the RF filter. The inductance of the RF transformer is affected by temperature. If the temperature changes too much, detuning of the filter can occur, making it difficult for the electronics in 300 amu units to achieve the RF voltages required to filter the higher weight molecules.

Warm-up Considerations:

When power is first applied to a 300 amu analyzer, a red warning (error) indicator on the ECU may light, and the software may give a message saying the unit cannot be tuned above a certain mass above 200 amu. As the unit warms up this tuning limitation will go away and the error light should go off. Warm up time varies from unit to unit and also depends on the mass range that is being scanned during warm-up.

Operation Recommendations:

When scanning high mass ranges for long periods of time, you should allow time between successive scans. If you are scanning up to a mass greater than 200 amu, use internal triggered scan mode instead of continuous scan mode. Set the trigger period somewhat longer than the scan time. For example, for a full 1 to 300 amu scan at scan speed 4 (which takes about 60 seconds) you should allow an equal length of time between the start of successive scans by setting the trigger period to 120 seconds or more. Using faster scan speeds when scanning masses higher than 200 amu (speeds 4 to 8) is also helpful.

When using a single mass monitoring mode (pressure vs. time, table, or annunciator modes), and sampling high masses, mass per unit time averaging is recommended. To do this, multiply each of the N masses (N = 1 to 10) being monitored by the dwell time at that mass (see table in the manual which relates dwell time to the scan speed parameter). Add these N products and divide this total by the sum of the N dwell times. It is suggested that you keep this resulting time weighted average less than 100 amu. If your result is higher than 100 amu, monitor additional low masses to reduce this weighted average.