

Georgia Tech Chemical Ionization Mass Spectrometer (GT-CIMS)

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Instrument

The CIMS instrument (Figure 1) consists of a low pressure ion molecule reactor (IMR) coupled to a quadrupole mass filter by an actively pumped collisional dissociation chamber (CDC) and an octopole ion guide. The vacuum system is a 100 mm outer diameter stainless steel chamber evacuated with two small turbo pumps (70 l s^{-1}). The mass filter is a set of 9.5 mm diameter quadrupole rods housed in the main vacuum chamber. The CDC is a short 80 mm diameter chamber that houses an octopole ion guide and is evacuated with a hybrid molecular drag pump. The IMR is evacuated with a scroll pump (300 l min^{-1}) that also serves as the backing pump for the mass spectrometer.

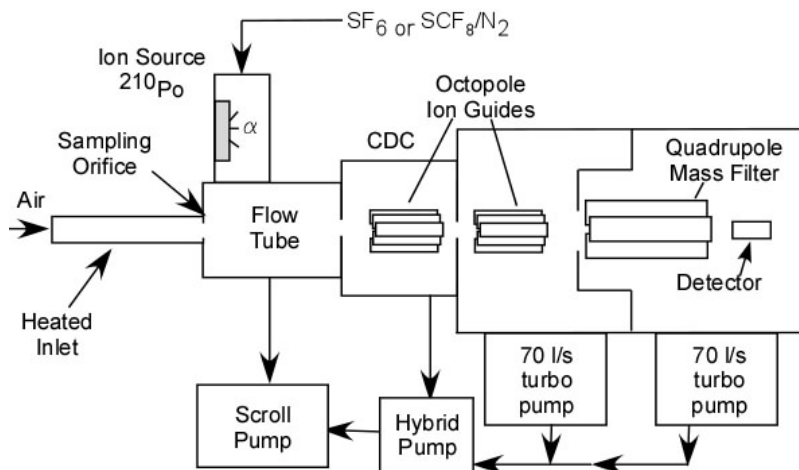
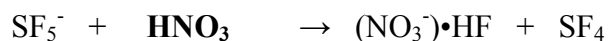
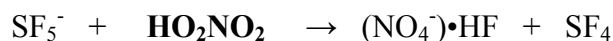


Figure 1. Schematic of CIMS system

Detected Species and Data

The CIMS will be configured to detect nitric acid (HNO_3), pernitric acid (HO_2NO_2), sulfur dioxide (SO_2), and hydrochloric acid (HCl). These species will be detected by the following ion molecule reactions:



Detection limits for all species are expected to be of the order of 10 pptv for a one second integration period. Each species will be measured each second with a duty cycle of 20%. The accuracy of the measurements are expected to range from 10% for HCl to 35% for HO₂NO₂.

Configuration for DC3/SEAC4RS

The CIMS instrument will be mounted in a standard HIAPER rack. The rack will house the CIMS, pumps, calibration sources, control and acquisition electronics, and an automated zeroing valve, and two small gas cylinders. One large gas cylinder will be mounted external to the rack. The instrument is designed for unattended operation for the DC3/SEAC4RS flights.

References:

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