MS solutions

By Simon Davis

Multi Gas 1

Dual inlet precision ^{13}C analysis with multi-aliquot CF analysis

MS Solutions IRMS product range
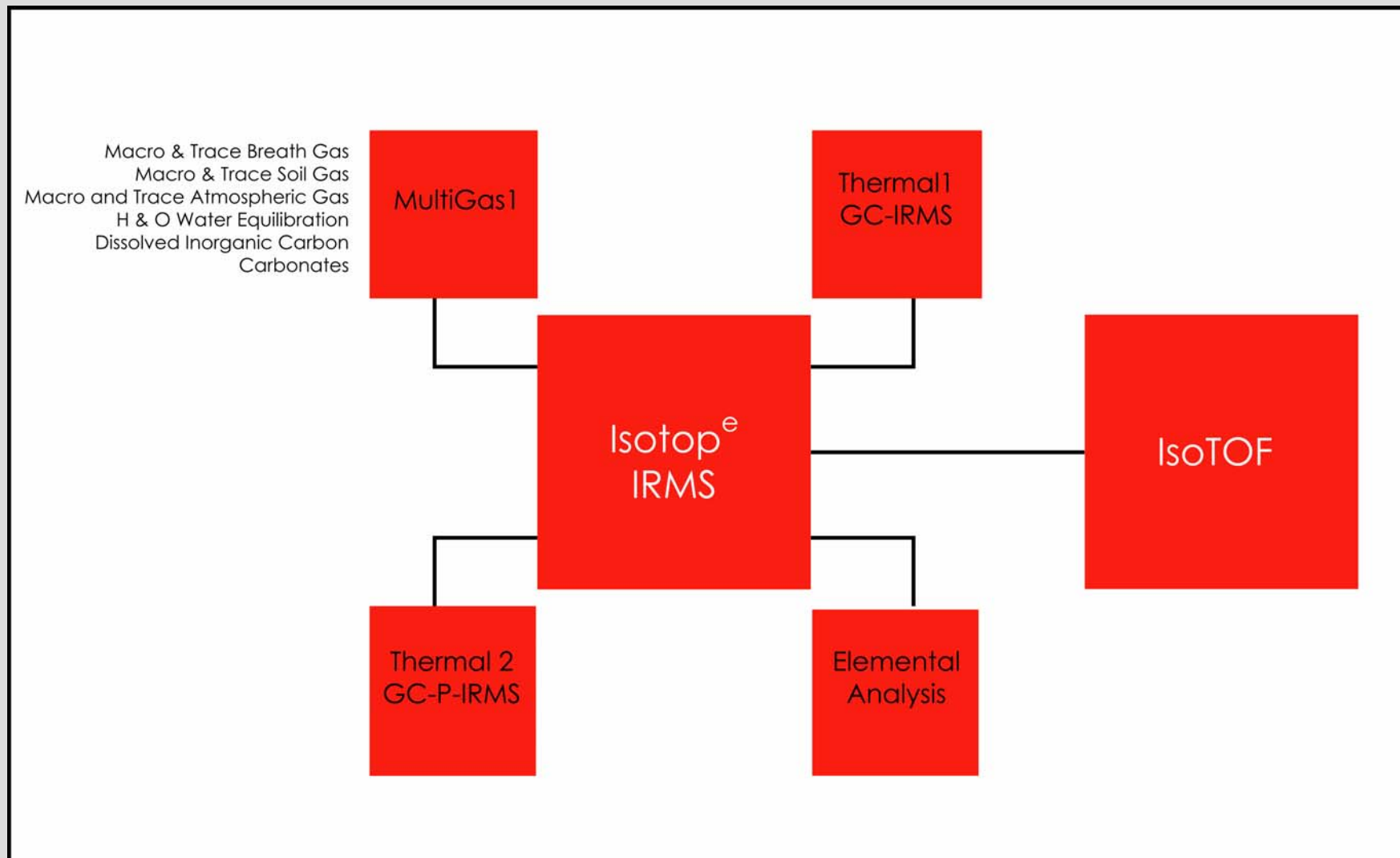
MultiGas1 Configuration

Cryo1
LN2 Cryo-focusing unit

LVA1
Large volume gas Auto-sampler

MultiGas1
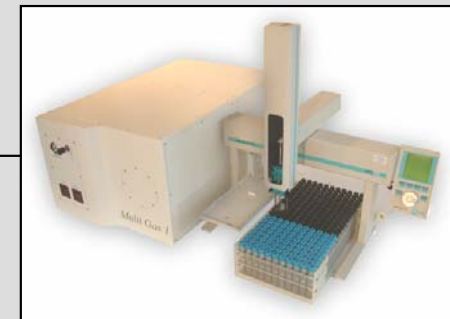Valve unit to which all other peripherals are attached

Macro Gas Configuration

EC1
Carbonates & water equilibration

The MultiGas has four optional peripherals that can be attached. This may simply consist of adding a Gilson or Combi Pal auto-sampler as shown in the macro gas configuration, or may be as complex as a large volume auto-sampler combined with cryo-focusing.

# Sample bottles compatible with the MultiGas

The standard configuration of the MultiGas can operate with all the sample flasks shown. The modular nature of the system enables bespoke systems to be offered if other types of sample flask are required.

Compatible with Masslynx and OS2.

Although designed to work with MS solutions MAP (Mass Analyser Pro) software, the MultiGas is fully compatible with Micromass / GVI control systems.
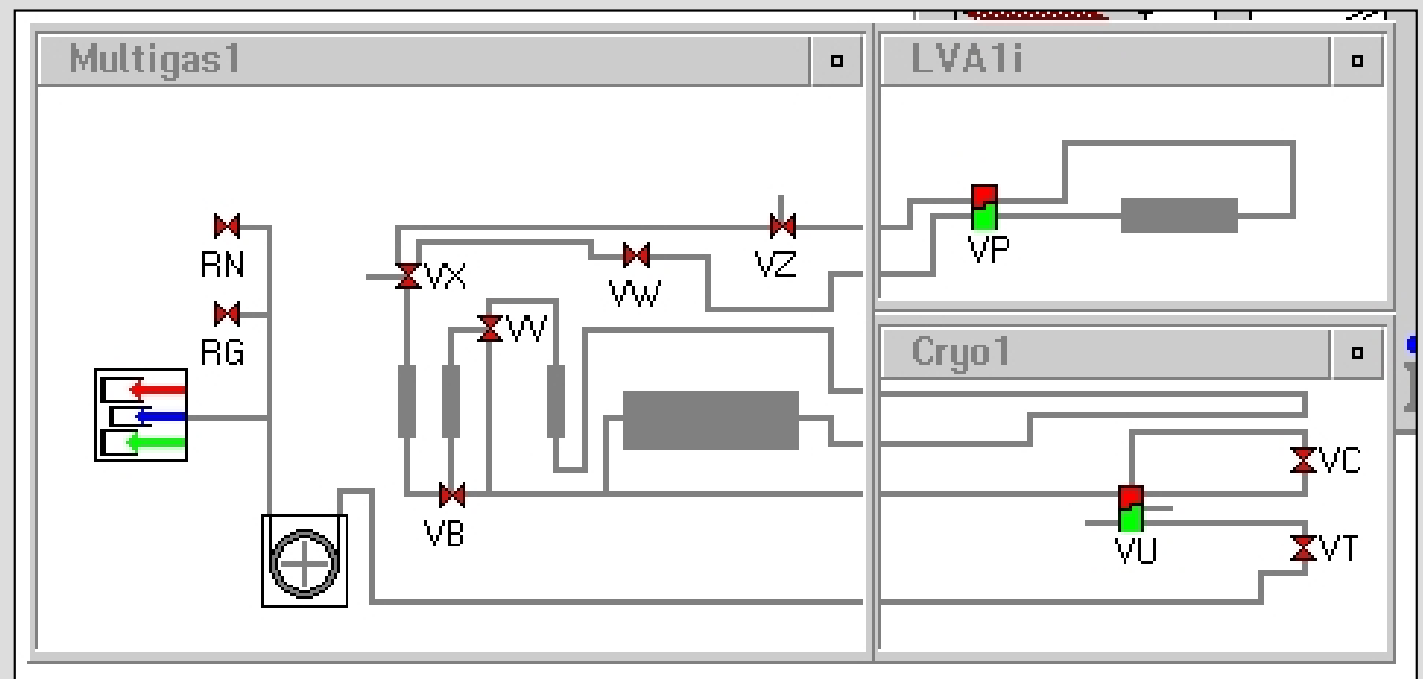
Dual inlet vs. Continuous flow IRMS

Advantages of dual inlet IRMS

• High internal precision (0.01 per mil or better)
• High external precision from sample manifolds (0.02 per mil or better)

Disadvantages of dual inlet IRMS

• Requires extensive off line sample preparation to remove unwanted gases, water and other possible contaminants
• Requires large sample volumes
• Long analytical times
• Instrumentation and consumable costs are high

Advantages of continuous flow IRMS

•No or little off line sample preparation
•Chromatographic separation of analytes
•Only requires small volumes of sample gas

Disadvantages of continuous flow IRMS

•Relatively poor internal precision

MultiGas injection valve block

- Permits multiple sample injection
- Low internal volume.
- Glass lined and electroformed nickel tubing.
- Gold plated ferrules on all metal on metal connections
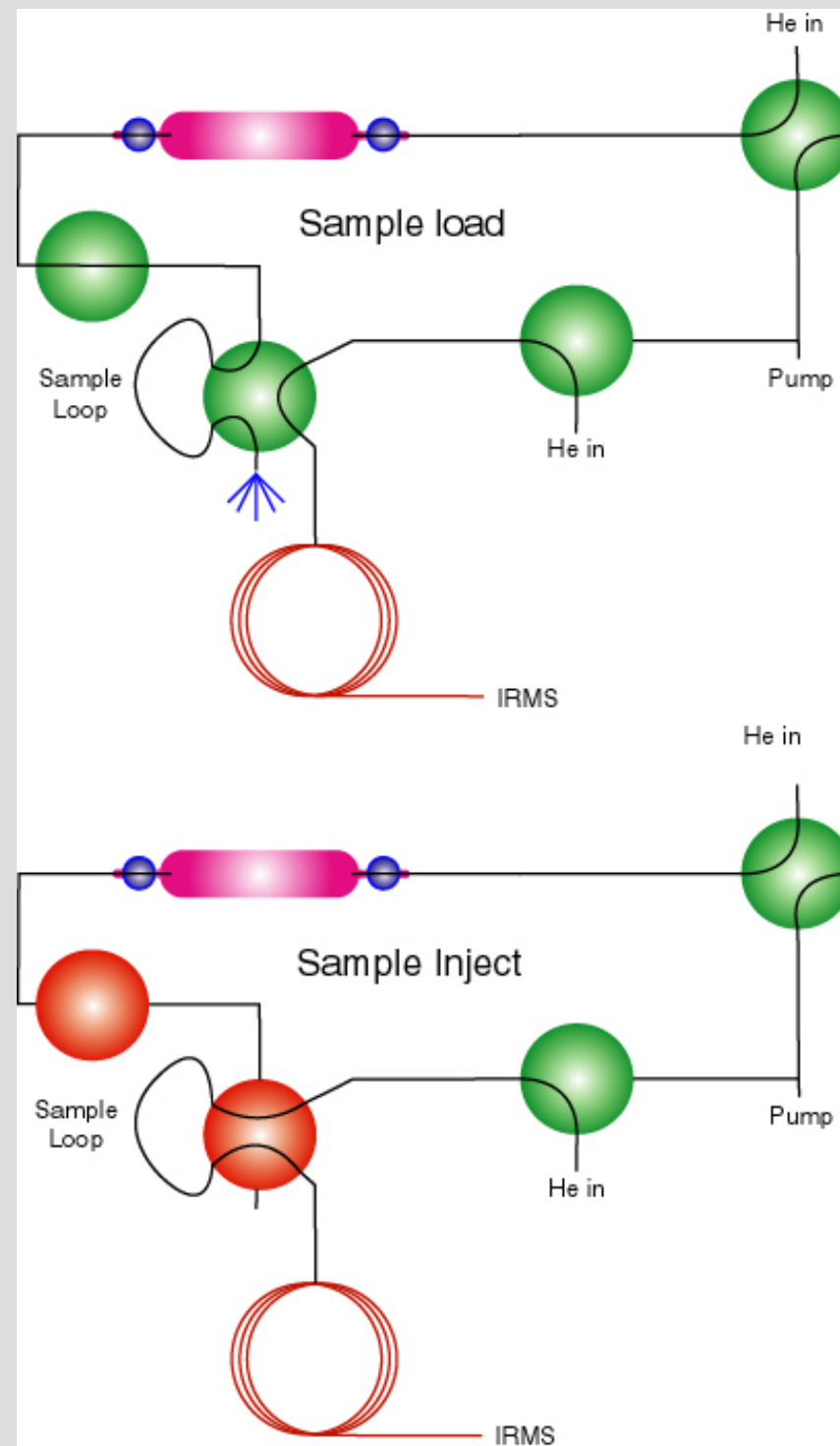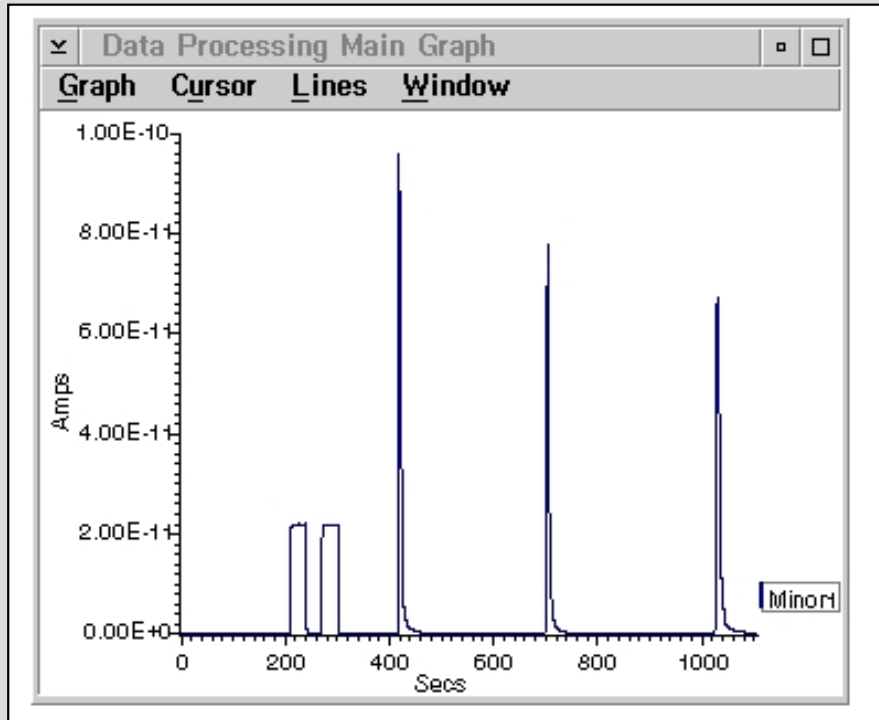- Ultra low leak rates of less than <10e-9 cc/atm/sec

MultiGas macro injection Configuration

Gas is taken from the sample vial and passed through a fixed volume loop. The flow of gas from the loop is then toggled to inject the volume of the loop into a GC column for chromatographic separation.
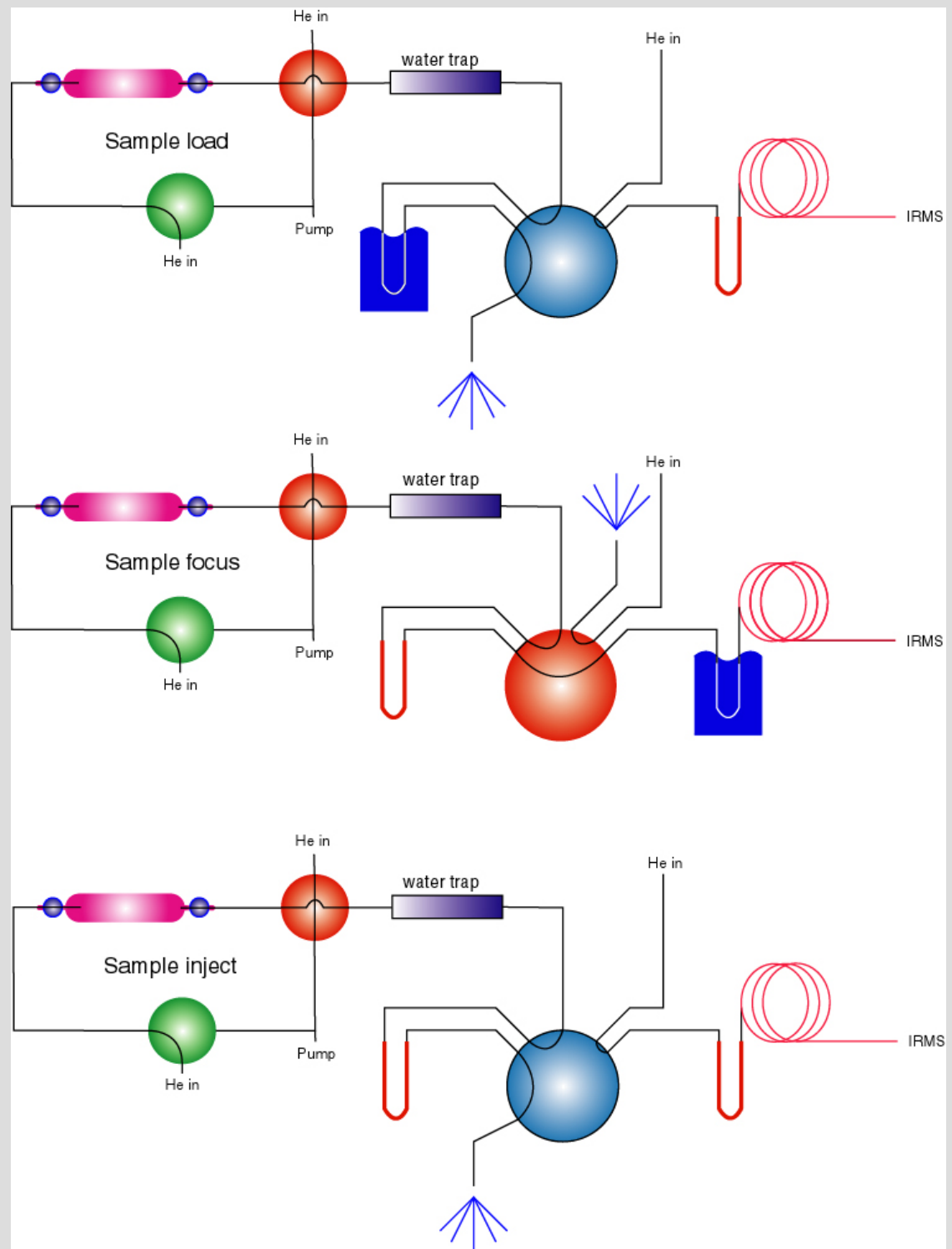
Results from Macro configuration analysis

Run	Mean Value (‰)	n	Mean Value (‰)	n
1	-36.78	3	-36.80	10
2	-36.58	3	-36.57	10
3	-36.70	3	-36.70	10
4	-36.52	3	-36.50	10
5	-36.54	3	-36.52	10
6	-36.67	3	-36.67	10
7	-36.60	3	-36.60	10
8	-36.66	3	-36.66	10
9	-36.71	3	-36.71	10
10	-36.54	3	-36.52	10
mean	-36.63		-36.63	
sd	0.08		0.10	

Multiple injections of samples from a single vial greatly improved precision over single injections.
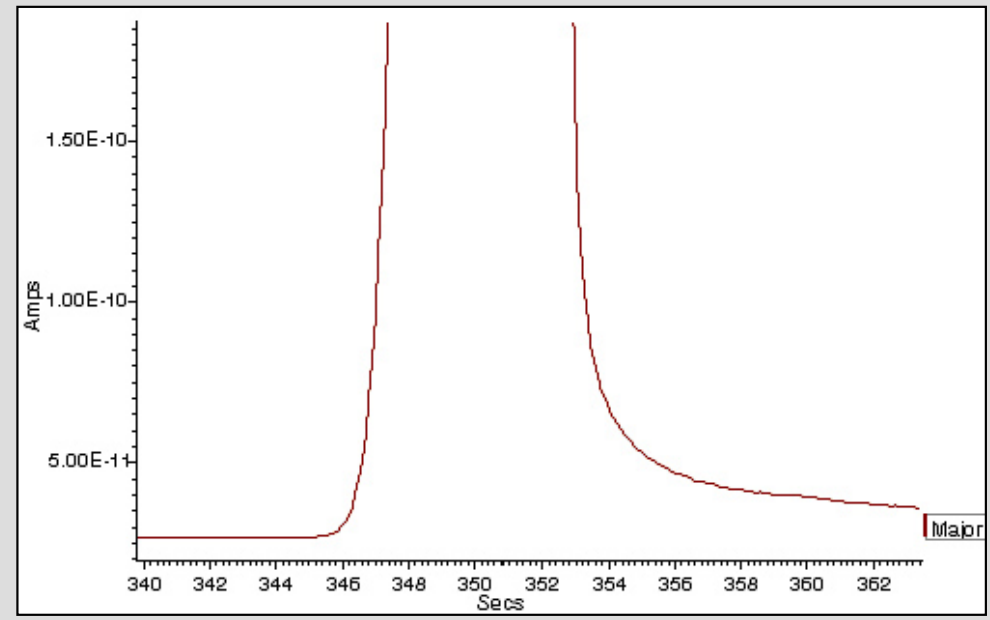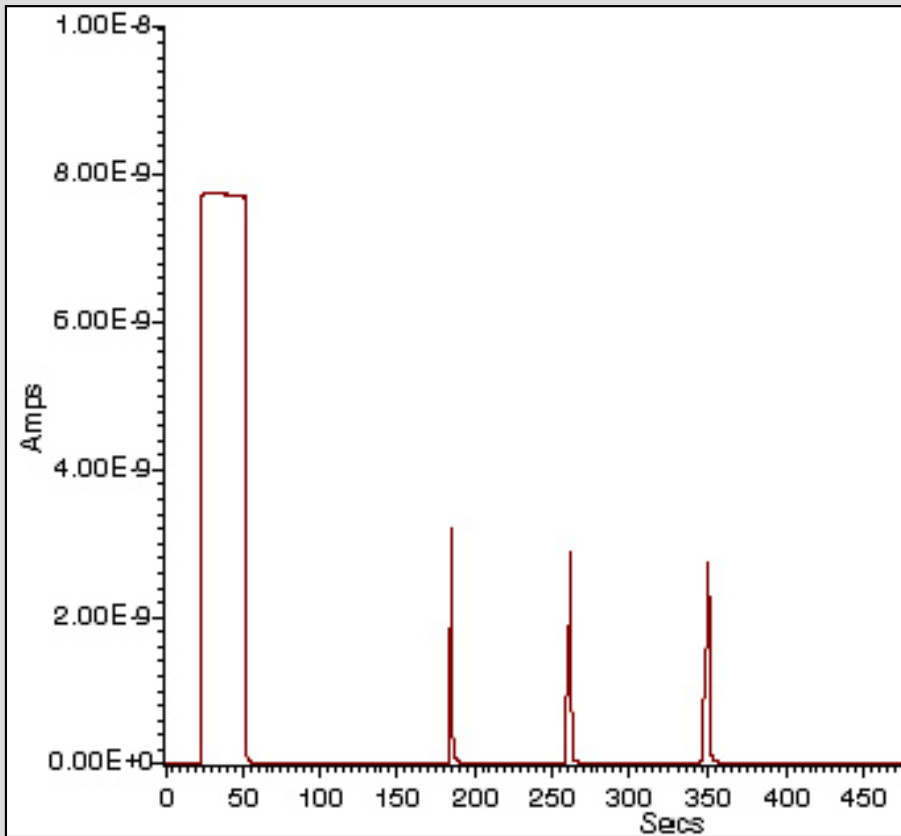
MultiGas
trace configuration

The trace gas configuration functions in the same manner as the macro configuration, but with the addition of cryo trapping and cryo focusing.

Results from MultiGas trace configuration

Overall comparison between different analytical techniques

| System used for analysis	Standard	n	Number of sample peaks	Mean Value (‰)	Standard Deviation	Standard Error
Automated Trace Gas-IRMS (Micromass isoprime)	Standard C	10	1	-36.62	0.2	0.06
MS solutions Macro Configuration	Standard C	10	3	-36.59	0.08	0.04
MS solutions Trace Configuration	Standard C	10	3	-36.53	0.02	0.01
Dual Inlet IRMS (VG Prism 2)	Standard C	10	10	-36.5	0.02	0.01

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MAP Mass Spec Control Software

MS solutions

MAP (Mass Analyser Pro) is the fully functional software package to control both the MS solutions Isotop^e and IsoTOF MS. This unique software enables a single graphical display of both mass spectral data and isotopic data.

MAP also links directly to the Analyser Pro LIMS system, which can be either server or web based. In essence this is a fully developed workgroup operating system that can match anything currently on the market.
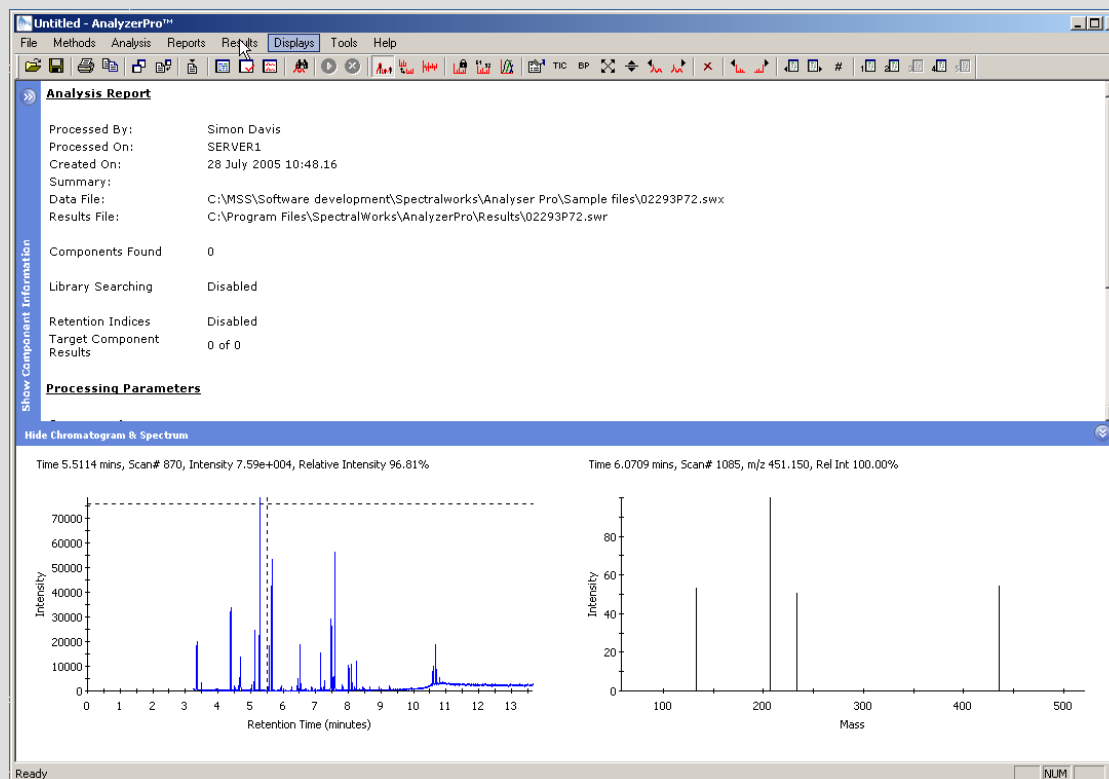
A demonstration version of the software can be downloaded from: http://www.spectralworks.com/

Isotop^e IRMS

The Isotop^e IRMS is still under development and will be launched sometime in Q4 of 2005. Some of the key points of design are listed below:

- Reduced αr^2 due to 120° geometry.
- Differential pumping as standard.
- Flight tube geometry designed to eliminate all stray ion beams
- Reduced strength of source magnet resulting in greatly reduced mass discrimination and hence linearity.
- Pre magnet / post source ion beam focusing.
- Two coil magnet with ultra low stray fields.
- 8mm flight tube inside clearance for the ion beams.