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# PQMS PERFORMANCE

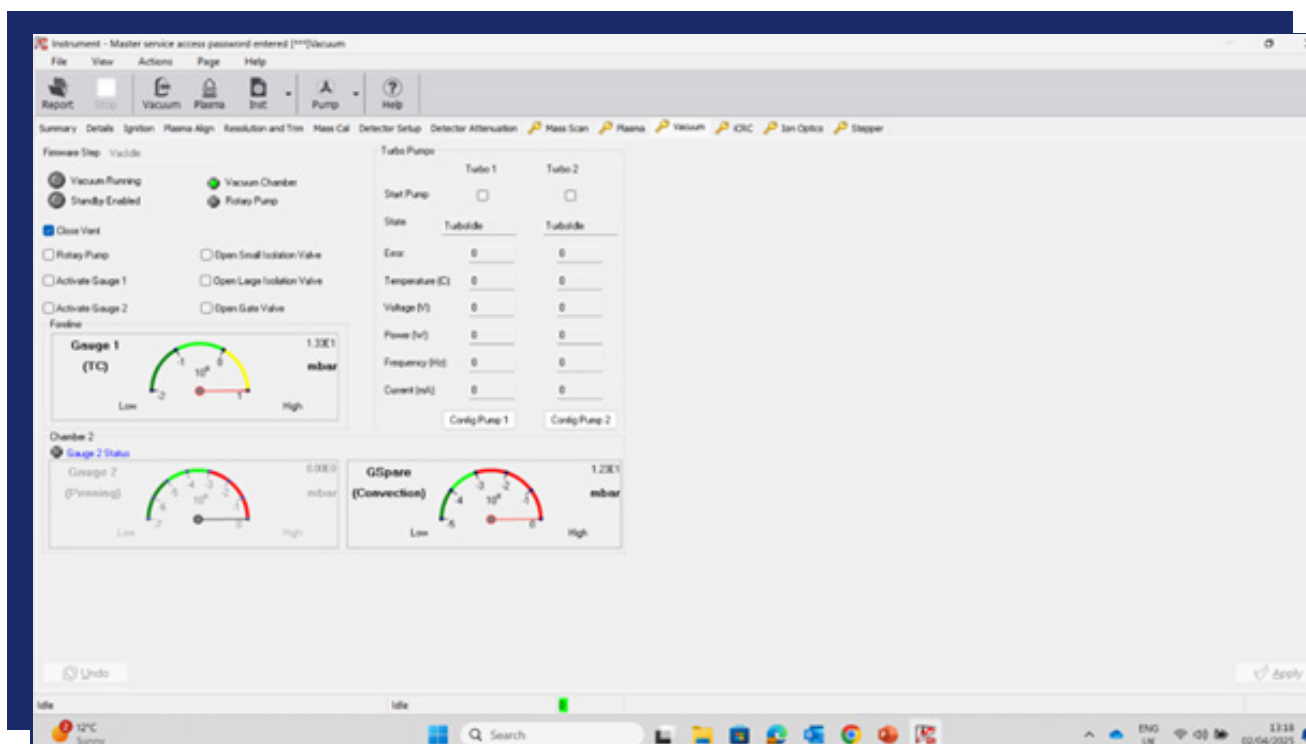
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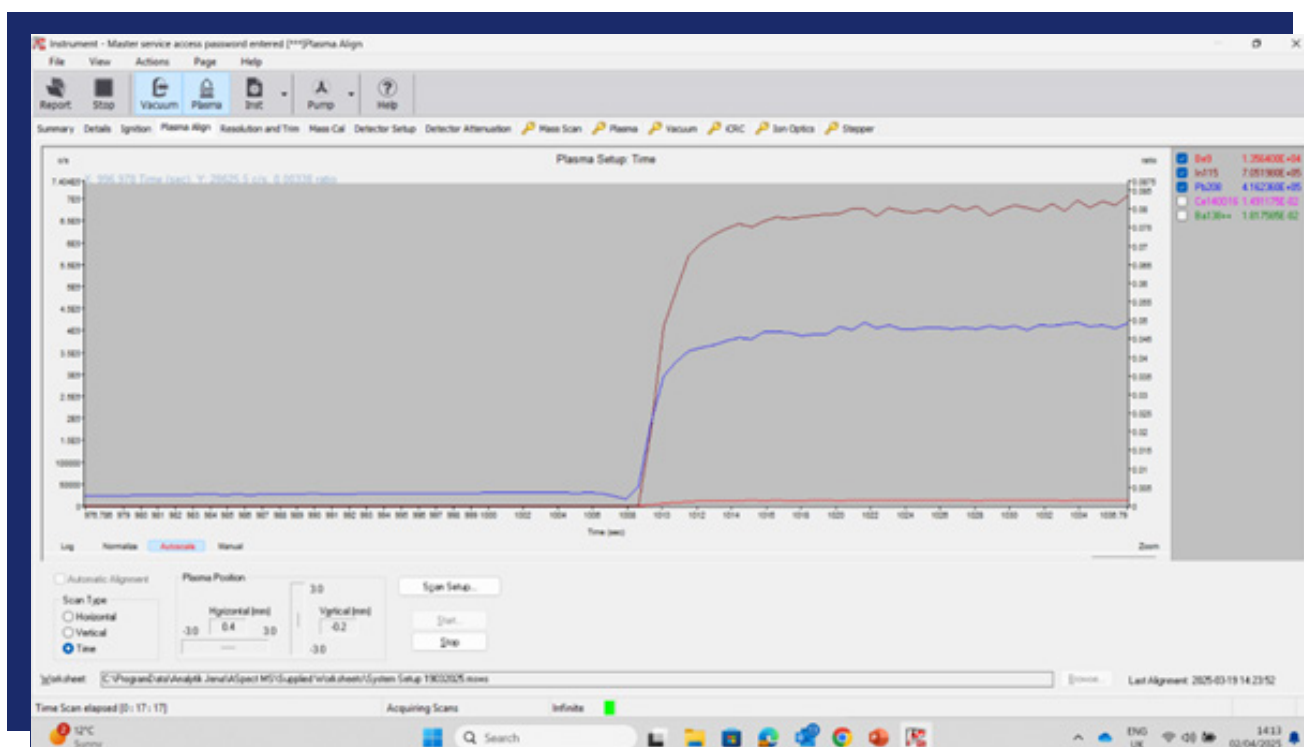
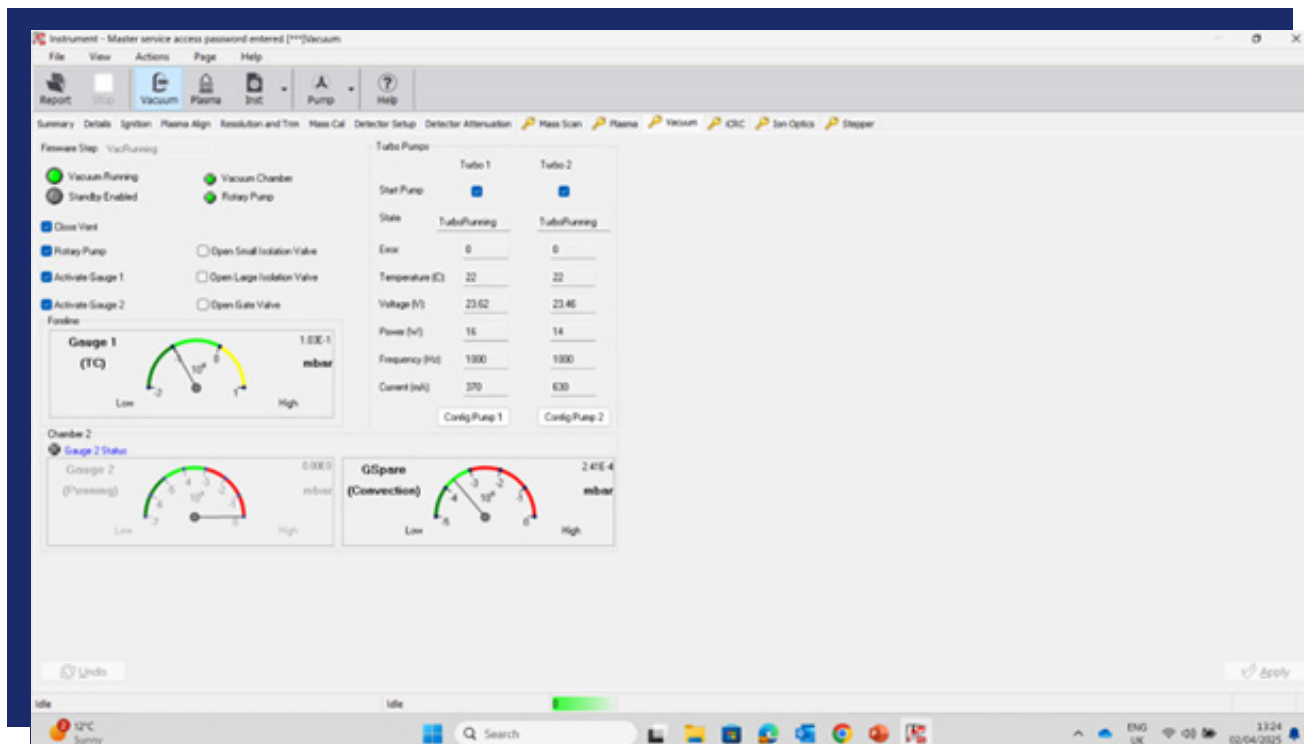


# PQMS Performance

## How long does it take ICP-MS to turn on (from shutdown with no vacuum to a usable signal)?

The PQMS system pumps down to an operating vacuum in about 10 mins. The system is fully operational for within 30-60 minutes, as shown below using 1 ppb tuning solution. Ideally a longer stabilisation period better performance.





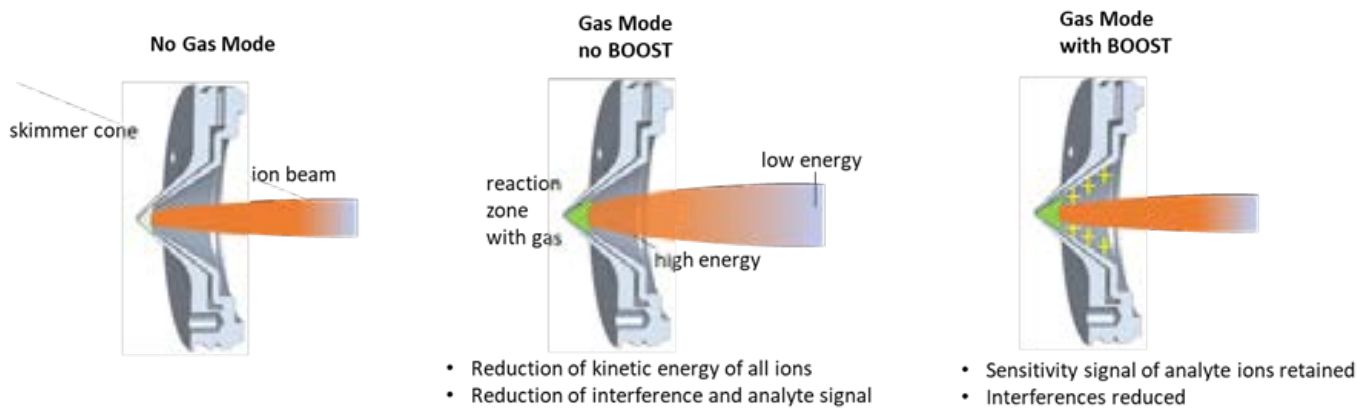
## How sensitive is ICP-MS?

The PQMS provides unmatched sensitivity compared to other single-quadrupole ICP-MS. This is achieved by the advanced arrangement of sampling and skimmer cones and the refocusing ion mirror.

The PQMS also has enhanced sensitivity in Helium collision and Hydrogen gas modes. Collision/reaction is performed using the iCRC located within the skimmer cone of this

instrument. This allows optimization of lens focusing for gas modes, and refocusing of the ion beam using BOOST (applying charge to the skimmer cone).

This refocusing is not possible in any other single-quadrupole ICP-MS where the collision/reaction cell is located between the sample interface (plasma/cones/ion lenses) and the mass analyser.



## What is the typical working range of ICP-MS?

Typical ICP-MS instruments use a dual detector system, with using pulse (digital) counting for lower concentrations and analogue detection for higher concentrations. This requires frequent cross-calibration between the detectors.

The AD Detection, all-digital detection, system provides 11 orders of analytical range (0.1–1010 cps) in pulse-counting mode only. This enables fast and accurate multi-element analysis from ultra-trace to high concentrations in a single measurement and ensures exceptional detector lifetime.

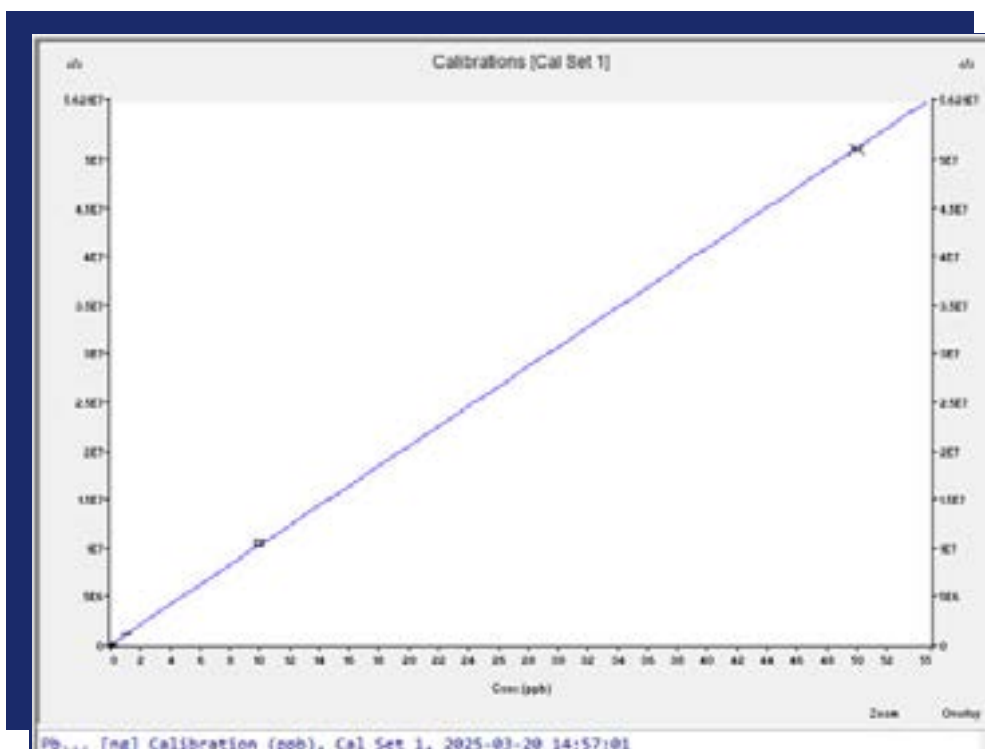
Optimisation of attenuation factors for the detector are typically performed once-per-year during the instrument preventative maintenance.

## Field test of PQMS

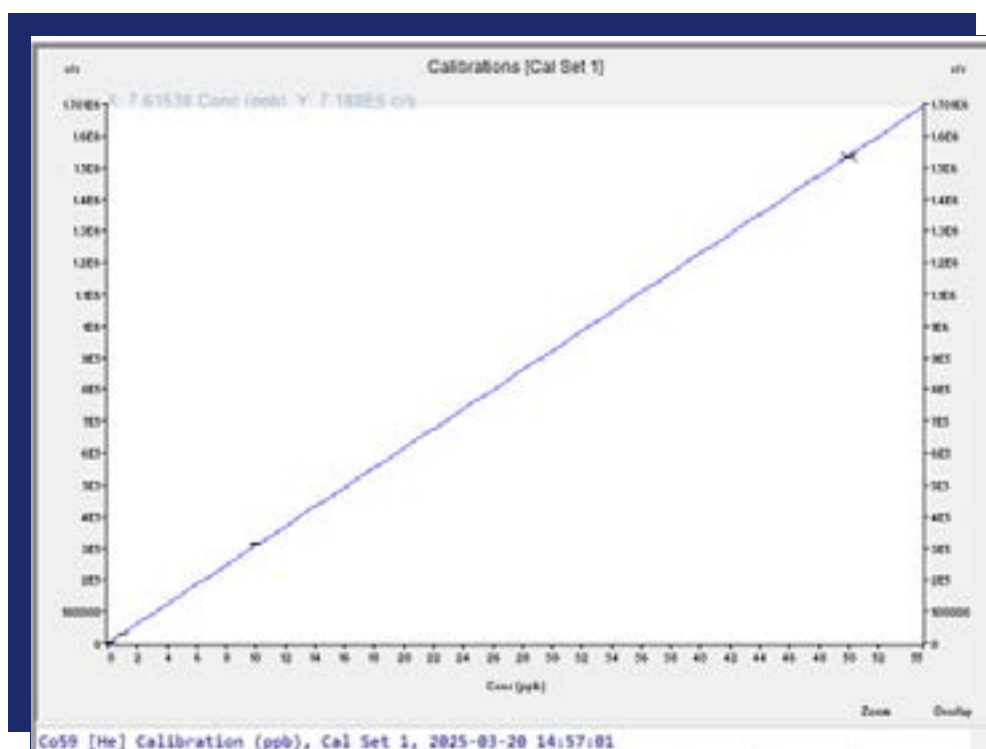
Example data from SciMed's current demonstration instrument, which is the "Q" version of the PQ ICP-MS, optimized for routine usage is shown below.

The PQMS easily achieves sensitivity specification of >80K cps for 1 ppb In.

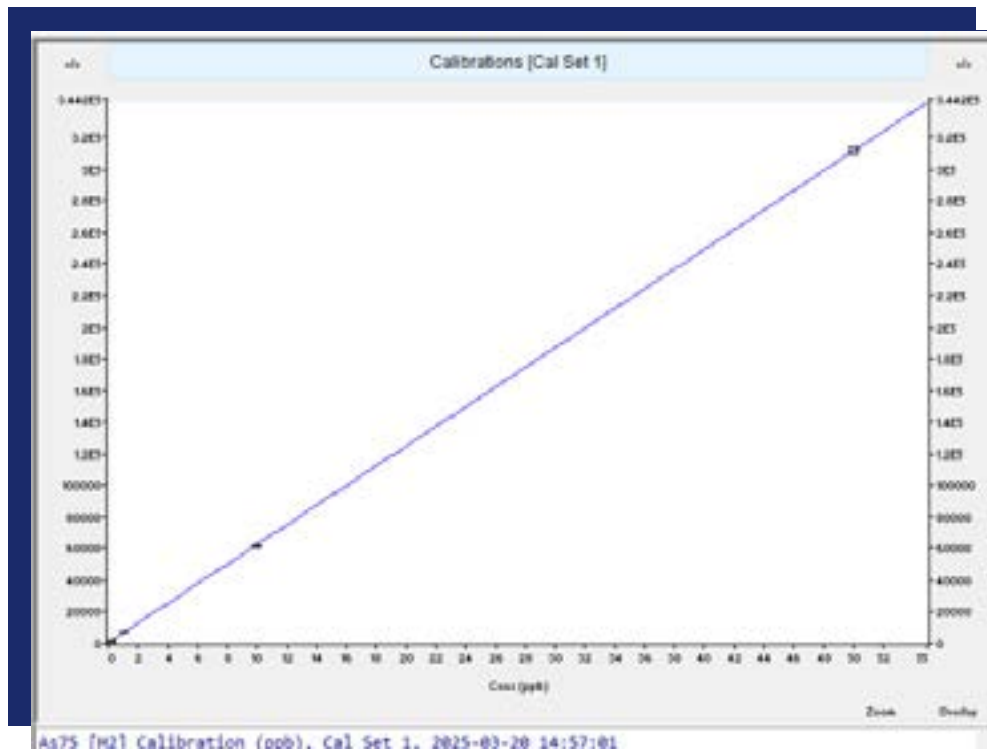
Rack # Tube	Sample Label	Be9 c/s	Mg25 c/s	Co59 c/s	In115 c/s	Ce140 c/s	Pb206 c/s	Ce140016/Ce140 c/s	Ba138++/Ba138 c/s
1	Blank	396.0000	28038.24	14978.12	431.3000	1424.800	2296.800	0.044	0.072
2	1 ppb Tuning solution	13174.72	49458.64	345597.8	819953.9	882523.1	251377.1	0.022	0.018
3	Sample 1	13164.34	50487.94	347664.0	821317.8	888307.8	250929.4	0.021	0.018

**206+207+208 Pb (no gas)**

Interference management is provided by the unique iCRC system, which allows post-collision/reaction refocusing of the ion beam, which is not possible in conventional single quadrupole ICP-MS. This is shown by calibration curves of cobalt in helium mode and arsenic in hydrogen mode.

 **$^{59}\text{Co} > ^{59}\text{Co}$  (Helium collision)**

## $^{75}\text{As} > ^{75}\text{As}$ (Hydrogen reaction)



	Mn55 (He)	Co59 (He)	Cu65 (He)	Zn66 (He)	Cd114 (ng)	Pb... (ng)	Fe56 (H2)	As75 (H2)
10 ppb	2604	3632	2076	980	16423	145448	10188	1393
Lin. Cal	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
LOD ppb 3xs.d of blank*	0.025	0.026	0.030	0.088	0.009	0.010	0.242	0.087

\*measurements were performed in the SciMed demonstration facility rather than an dedicated ICP-MS laboratory, non-clean room conditions, high purity water, trace metal grade  $\text{HN03}$ , no hepa filter cabinet, etc. The LODs are therefore blank limited.



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