

AA

Varian  
SpectrAA  
50/55/110/220



**VARIAN**

Varian, Inc. is a world leader in instrumentation for atomic spectroscopy. From our development of the first components for atomic absorption spectrometers in the 1950s to the recent ground breaking Vista series of simultaneous ICP emission spectrometers, Varian, Inc. has over 40 years experience of innovation and development in all areas of atomic spectroscopy.



Since their introduction in 1985, Varian's SpectrAA series atomic absorption instruments have been chosen by thousands of analysts around the world for their ease-of-use, reliability and performance with challenging samples. The new generation of SpectrAA series instruments continues this proud tradition, offering the superb performance, simplicity of operation, and industry leading software expected from a world leader in atomic spectroscopy.

Varian's SpectrAA series provides you with the ideal solution to your atomic absorption needs. The SpectrAA family ranges from stand-alone systems (SpectrAA 50/55) and PC-controlled instruments with varying levels of automation (SpectrAA 110/220), through to the innovative Fast Sequential AA (SpectrAA 220 FS) and our high-performance SpectrAA 880. When combined with the modular design and complete accessory options, the SpectrAA series can be configured to meet all your analytical and budgetary needs.

The SpectrAA Family comprises:

**SpectrAA 50**  
Stand-alone single beam AA spectrometer

**SpectrAA 55**  
Stand-alone double beam AA spectrometer

**SpectrAA 110**  
PC-controlled single beam AA spectrometer

**SpectrAA 220**  
PC-controlled double beam AA spectrometer

**SpectrAA 220 FS\***  
A fully automated double beam system with Fast Sequential operation for improved productivity

**SpectrAA 880\***  
Our highest performance system featuring fully automated hardware and research grade optics

\* Refer to separate brochure for details



## High performance entry level AA

Varian's SpectrAA 50/55 series instruments are ideal for any laboratory requiring an entry level AA system with advanced capabilities. The single beam SpectrAA 50 and the double beam SpectrAA 55 feature a LCD screen and dedicated keyboard enabling simple, stand-alone operation.

### On-screen display

The SpectrAA 50/55 interface enables you to view and edit instrument parameters on-screen, ensuring fast, easy operation. Complete results, including concentration, precision and replicate readings are displayed. This allows you to confirm results as each reading is completed. After calibration, you can view the calibration graph to check goodness of fit, or read absorbance or concentration values from the graph.

### Multi language support

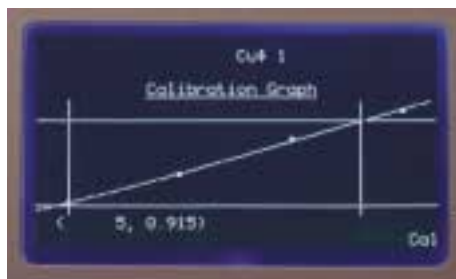
The interface is available in a choice of languages. Language selection can be changed at any time, making this instrument ideal for use in a multilingual environment.

### Easy setup

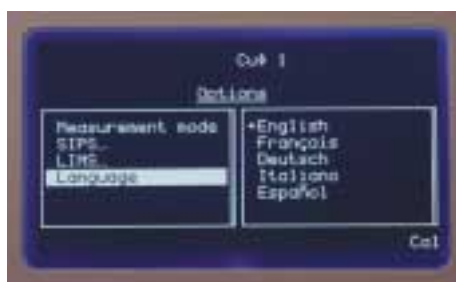
Advanced features such as automated wavelength and slit selection ensure easy setup, even for novice users. Two lamp positions are provided so you can complete one analysis while pre-warming the lamp for the next element in sequence.

### Cookbook and custom methods

Cookbook methods with recommended instrument parameters are provided for all elements. These methods can be recalled and modified at any time. You can also save up to 30 customized methods, providing easy access to your most common analyses. When you recall a method, the fully optimized instrument conditions are loaded into the system for immediate use.



The SpectrAA 50/55 series can be used with the revolutionary SIPS (Sample Introduction Pump System). SIPS enables you to perform online calibration from a single standard and fast online dilution of over range samples.



### **Background correction**

The optional, fast response deuterium background correction features a 2 ms response time for accurate correction of transient background signals. The deuterium lamp is located in the lamp compartment for easy optimization and fast replacement by the user (when required).

### **Upgrade to PC Control**

The SpectrAA 50/55 series can be upgraded from stand-alone operation to a PC controlled system for semi-automated, sequential, multi-element analysis. Upgrades can be performed at any time, ensuring that the instrument you purchase today will continue to meet your requirements in the future.

### **Full automation with SpectrAA 110/220**

The SpectrAA 110/220 series offers you enhanced capabilities, including full PC control and automated operation as standard. Based on the reliable SpectrAA 50/55 hardware, the SpectrAA 110/220 series is available with a range of options, including automatic lamp selection and programmable gas control, providing fully automated operation.

The SpectrAA 110/220 optics feature four lamp positions with automated wavelength and slit selection, and high intensity deuterium background correction as standard. Lamps are mounted in fixed positions, and a rotating mirror is used to select the operating lamp, eliminating the need for a conventional turret. For maximum stability in an automated sequence, a software controlled next-lamp warm up facility is provided

The SpectrAA 50/55 and the SpectrAA-110/220 are compatible with Varian's complete range of AA accessories.

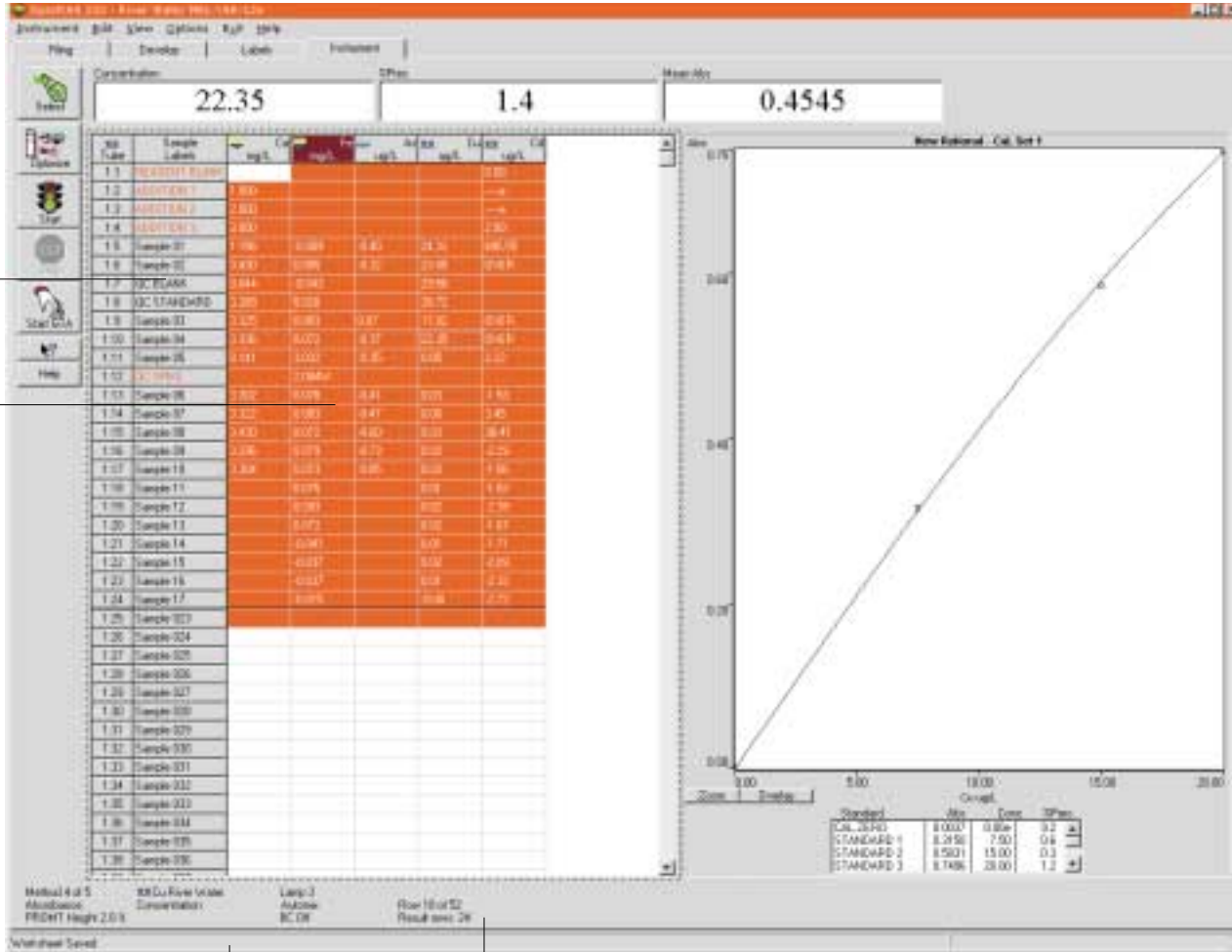
**Upgrade the SpectrAA 50/55 to external PC control for full accessory support. Experience the benefits of semi-automated analysis, including automatic sample presentation using the SPS-5 autosampler or trace analysis using the GTA-110 graphite furnace.**



Autocopy and unique pattern recognition capabilities simplify manual label entry. Alternatively, you can import directly from LIMS or use bar code readers to scan sample labels directly into the software.

View concentration results, precision and absorbance results as the analysis progresses. Color coding and flags (displayed after the sample result) highlight out-of-range results, uncalibrated results or other errors.

Using OLE-2, results can be exported on-line during analysis to other commercial software programs (e.g., Microsoft Excel), for custom data manipulation.



The message line informs you of the system status and provides operational hints.

Status display provides an instant summary of instrument conditions for the selected element and keeps you informed of progress during analysis.



The PC controlled single beam SpectrAA 110 and true double beam SpectrAA 220 combine the rugged and reliable hardware of the SpectrAA 50/55 series with Varian's acclaimed worksheet software. Using the multi-tasking capabilities of Windows, you can start today's analysis while simultaneously preparing a report on yesterday's results. Imagine the productivity improvements you will achieve. The spreadsheet concept at the heart of the SpectrAA software and the simplified interface also means minimal training is required.

### The Worksheet AA

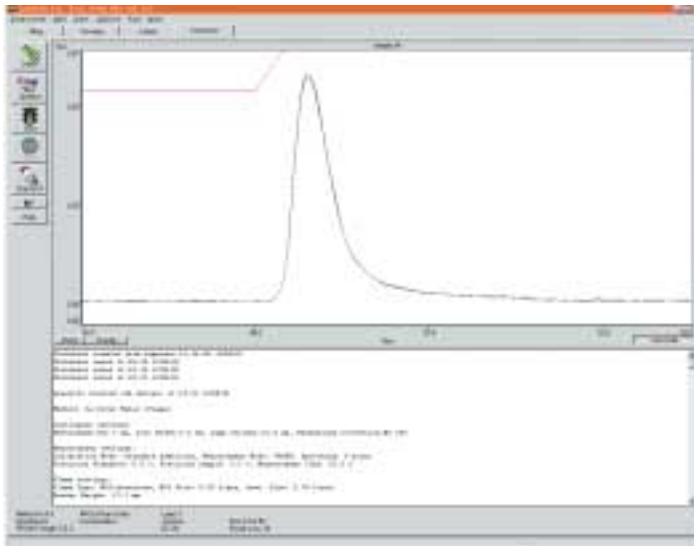
Final concentration results are displayed (after weight/volume correction if required) in a 'spreadsheet' concept common to many business applications. Results for flame, vapor and furnace determinations are displayed simultaneously so that you can view results for the entire batch of samples.

### Quality Control

Extensive rate and label driven Quality Control Protocols are provided to validate data as it is collected. The optional Quality Control Protocols software provides even greater capability for full compliance with all international regulatory requirements. This includes the capability to create custom QC tests.

### Which operating system?

Choose from Windows 95/98, Windows NT or Windows 2000 operating systems.



Click on an individual result to display the signal graphics, where stored and detailed results can be viewed. You can customize the display to view only the information you need. For example, select from the worksheet, signal graphics, calibration graph with full calibration data or the data log with complete analytical results. The data log is date and time stamped and includes all measurement parameters, raw data, final results and error messages.



Comprehensive multi-media Help includes step-by-step audio and video instructions on hardware setup and routine maintenance.

## Still the world's leading flame atomization system

Varian, Inc. flame atomic absorption systems have always set the performance benchmarks, and the Mark 7 design fitted to the SpectrAA series offers considerable improvements over competitive systems.

### Construction

High performance and unrivalled flexibility are combined with new ease of use features, such as 'twist and lock' assembly to simplify maintenance. Corrosion resistant components are standard, providing even longer durability.

### Reduced blockage

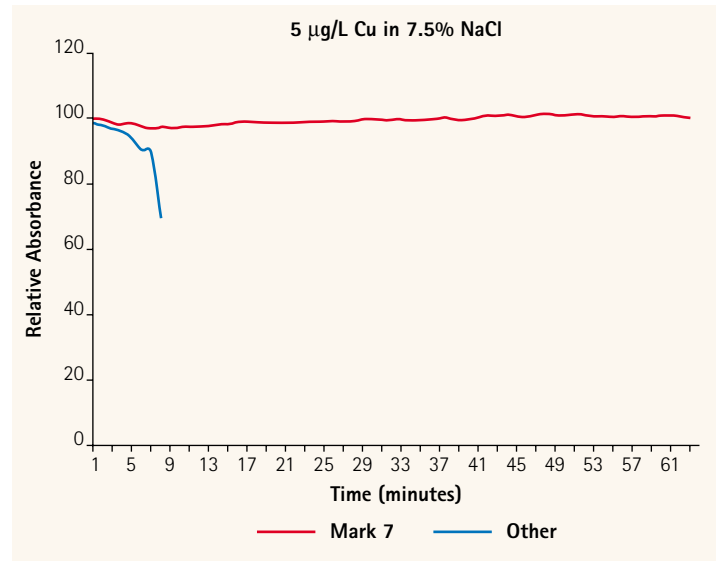
The contoured design of the Mark 7 burner provides a stable flame with outstanding resistance to blockage from dissolved solids or carbon build-up. This ensures longer running times, even with the most difficult samples.

### High sensitivity

High sensitivity and good precision are assured. Typical performance exceeds 0.75 absorbance units for 5 mg/L copper with precision of less than 0.5 % RSD routinely achieved.

Key advantages of the Mark 7 system include:

- High sensitivity: typically > 0.75 Abs from 5 mg/L Cu
- Excellent precision: < 0.5 % RSD from ten 5 sec integrations
- An externally adjustable impact bead that enables you to tune the system for maximum sensitivity or to achieve extended operation with difficult samples
- Precise, accurate determinations with reduced interferences
- Minimal burner blockage, even with the most difficult samples
- Excellent drainage without spiking, memory effects, or long wash-out times
- Rapid change-over to organics operation, by simply installing organic resistant O rings



The externally adjustable impact bead enables you to easily optimize sensitivity and precision.

High salt content in samples can rapidly induce burner blockage. The Mark 7 atomization system achieves excellent long term stability and reduced blockage even with continuous aspiration of a 7.5 % sodium chloride solution.



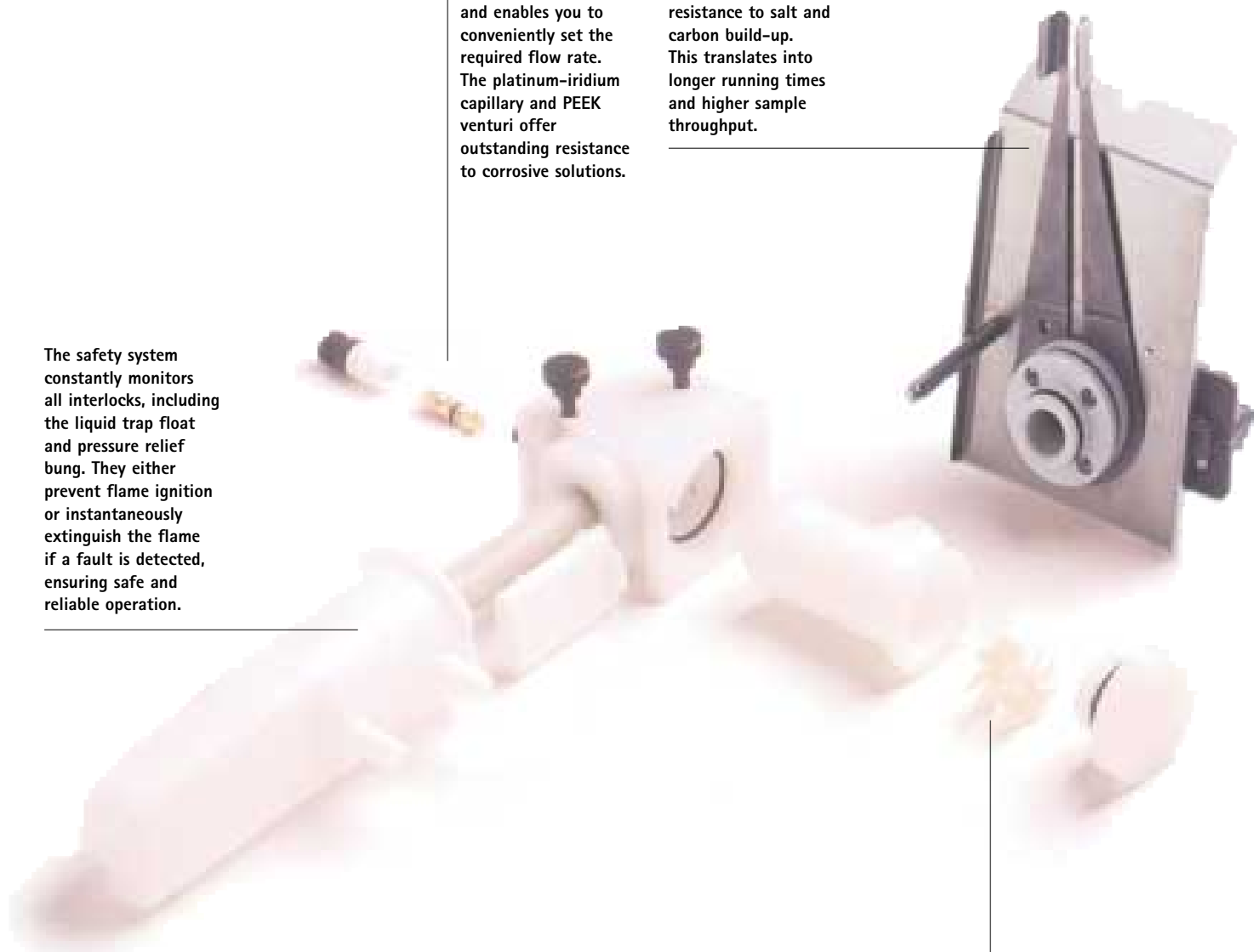
The safety system constantly monitors all interlocks, including the liquid trap float and pressure relief bung. They either prevent flame ignition or instantaneously extinguish the flame if a fault is detected, ensuring safe and reliable operation.

The adjustable nebulizer is compatible with all common solvents and enables you to conveniently set the required flow rate. The platinum-iridium capillary and PEEK venturi offer outstanding resistance to corrosive solutions.

The Mark 7 burner provides a stable flame with outstanding resistance to salt and carbon build-up. This translates into longer running times and higher sample throughput.

Disassembly of the spray chamber for cleaning is easy. Simply rotate the liquid trap to remove it and then twist the spray chamber to separate it from the nebulizer block. No tools are needed and there are no safety chains or exposed gas hoses to remove.

The twin headed mixing paddles remove unfavorably large droplets, reducing interferences and minimizing burner blockage, even when aspirating high dissolved solids solutions.



### More than autosampling!

Automate your analysis with the SPS-5 (Sample Preparation System) and enhance the productivity of your laboratory.

The SPS-5 offers so much more than any other autosampler, with unmatched sample capacity for extended operation, off-line sample preparation capabilities, and a flexible choice of racks accommodating different test tube types. You even have the flexibility to use your own racks.

Key capabilities include:

- Capacity for up to 500 solutions, loaded in convenient sample racks
- The ability to determine more solutions, simply by changing racks
- A choice of five inert rack types for different vessel sizes
- A flexible 'Type 25' rack with adjustable settings to accommodate different tube heights and low cost rack overlays for alternative tube diameters
- Automatic rack identification that reduces rack-changing errors. All racks contain a unique magnetic code that enables the software to identify racks loaded during analysis.
- A custom rack definition feature that enables you to program the SPS-5 to accept any rack type in any position.
- A programmable probe height that enables layers within a solution to be sampled
- Three rack positions are supported as standard
- An optional rack extension supports two additional racks



### Off-line sample preparation

By combining the SPS-5 with the optional Diluter and Roboprep software, you can prevent the problems associated with sample preparation. Tedious, time-consuming solution preparation is eliminated, as are volumetric based dilutions that are prone to error. SPS-Roboprep achieves real productivity gains by providing a powerful sample preparation system that is cost effective and practical. The SPS-Roboprep can be used off-line, while the laboratory is unattended, for preparation of:

- Single or multi-element calibration standards
- Single or multi-element addition standards
- Spiked samples for spike recovery studies
- Single or serial dilution of samples with addition of up to 2 reagents to maintain sample chemistry

Solutions are automatically stirred with Smart Mixing to ensure homogeneity.

**The SpectrAA 110/220 can be combined with the revolutionary SIPS and the SPS-5 flame autosampler for a fully automated system. SIPS can also be used with manual sample introduction.**



### SIPS—A revolution in sample introduction

Varian's SIPS (Sample Introduction Pump System) is an innovative sample introduction and dilution system for flame AA. Using the revolutionary SIPS, you can eliminate multiple standard preparations and dramatically simplify over-range sample dilution.

SIPS is available in two versions—the single pump SIPS-10 and the dual pump SIPS-20. When used with the SpectrAA flame series instruments, both systems provide:

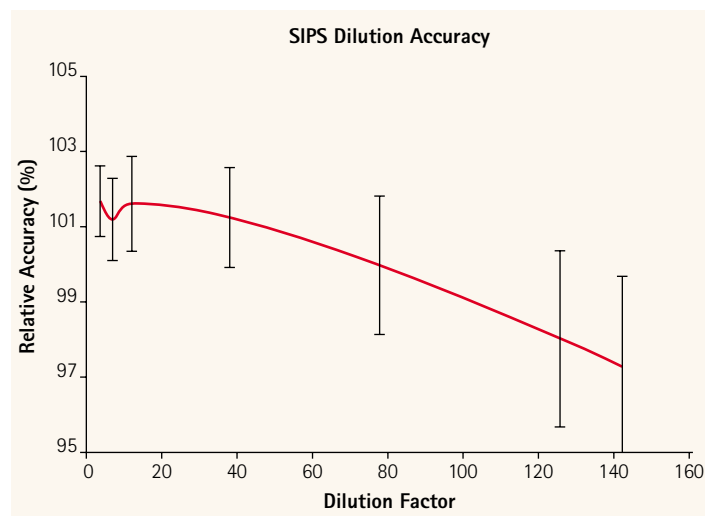
- Multi-point calibration from a single standard
- Intelligent on-line dilution of over range samples
- Simplified operation and improved productivity

The dual pump SIPS-20 provides even greater capability. When used with the SpectrAA 110/220, the SIPS-20 can:

- Automate the tedious task of flame standard additions calibrations
- Perform on-line spiking of samples for spike recovery studies
- Add modifiers such as ionization suppressants on-line

### The benefits of SIPS

- Provides on-line multi-point calibration from a single standard
- Eliminates tedious multiple standard preparation
- Eliminates dilution errors during standard preparation
- Provides fast on-line dilution of over range samples with 'Smart Rinse' to reduce memory effects
- Eliminates manual dilution and re-analysis of over-range samples
- Provides excellent dilution accuracy with less than 2% error



- Extends the linear dynamic range of flame AA, approaching that of ICP-OES
- Improves the productivity of flame AA determinations

### On-line calibration

Using SIPS, only one calibration standard is required. Simply define the standard concentration and the number of calibration points required. SIPS does the rest for you—automatically preparing the calibration by diluting your standard on-line.

### Fast on-line dilution

SIPS will also automatically dilute over range samples without any operator intervention. If any solution is over range, measurement is terminated automatically after the first replicate. A 'Smart Rinse' is then performed, where diluent is aspirated to wash out the atomization system. After checking for possible contamination, the over range sample is re-measured with dilution applied. 'Smart Rinse' optimizes rinse times, minimizes memory effects and increases sample throughput.

**SIPS provides superb accuracy with performance exceeding that achieved using manual dilutions. Typical dilution performance across the dilution range is shown.**

## Superior furnace performance for difficult samples

### Constant Temperature Zone design

Varian's furnace research has demonstrated that the best graphite furnace performance is achieved using a Constant Temperature Zone (CTZ) graphite furnace. The CTZ is created by carefully matching the design of the GTA-110 power supply to low mass, end-heated graphite tubes. The GTA-110 also features the most advanced furnace sampling systems.

When coupled with the SpectrAA series, Varian's longitudinally heated GTA-110 CTZ graphite furnace provides a fully automated system capable of tackling difficult samples and achieving exceptional performance.

### Benefits of the CTZ design

The proof of Varian's CTZ is performance. Varian's CTZ design GTA-110 graphite furnace provides:

- Rapid, even heating of the low mass, end heated graphite tubes
- High sensitivity, from the long atom cell and CTZ design, ensures the lowest possible detection limits
- Reduced memory effects, even for the difficult refractory elements
- Accurate and reproducible temperature control, achieved using our patented Dynamic Feedback Temperature Control system
- Optimized inert gas flows ensure extended graphite tube lifetimes are achieved, providing economical operation.

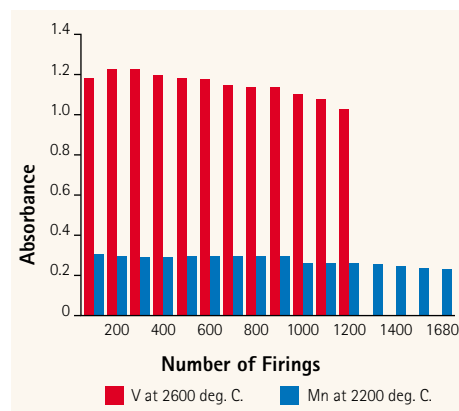
### Typical performance

Element	Wavelength (nm)	Slit Width (nm)	Characteristic Mass (pg)	Detection Limit (3 sigma) Peak Height (µg/L)	Detection Limit (3 sigma) Peak Area (µg/L)
Al	396.2	0.5	5.0	0.2	0.2
As*	193.7	0.5	6.0	0.25	0.4
Cd	228.8	0.5	0.2	0.01	0.01
Cr	357.9	0.2 R	1.5	0.075	0.075
Ni	232.0	0.5	4.8	0.5	0.5
Pb*	283.3	0.5	3.0	0.2	0.25
Se*	196.0	1.0	10	0.3	0.3
Ti	364.3	0.5 R	50	0.75	0.85
V	318.5	0.5	22	0.5	0.75

\* Determined using an UltraAA lamp

R = reduced slit height

Typical characteristic mass figures (the mass of analyte required to produce 0.0044 absorbance) and 3 sigma detection limits are shown.



Using Varian's GTA-110, typical tube lifetimes easily exceed 1000 firings, even for the difficult refractory elements.



## UltraAA lamps—lower detection limits

Whether you are using flame, furnace or vapor AA, Varian's range of UltraAA lamps increase sensitivity and reduce detection limits, allowing determinations of trace metals at even lower levels. The UltraAA lamp series of high intensity, boosted discharge, hollow cathode lamps can be used with all SpectrAA series instruments, for the most demanding applications.

### Lamp operation

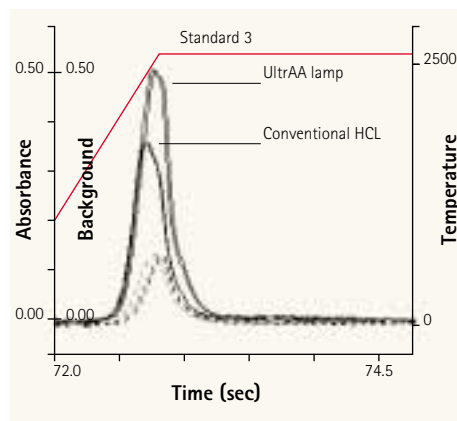
UltraAA lamps use the standard lamp current, but apply a second discharge within the lamp. This boost current is supplied from an external control module. The resulting sharper emission profile reduces self-absorption and line broadening, increasing sensitivity of AA determinations by up to 40%. Emission intensity is also increased by three to five times, reducing baseline noise levels. The lower baseline noise levels and the higher sensitivity ensure lower detection limits can be achieved.

### Benefits of the UltraAA lamp

- Increased sensitivity—comparative signals for a 75 µg/L Se standard are shown (in the graph opposite)
- Lower detection limits
- Enhanced calibration linearity
- Longer lamp lifetimes—typical lamp lifetimes exceed 8000 mA hours of operation
- Simple installation—lamps are mounted directly into the socket (without any flying leads), just like conventional lamps
- A fixed boost current eliminates difficult manual adjustments
- Automatic lamp recognition enables the software to identify the lamp and select the recommended operating conditions
- Enables simultaneous operation of two UltraAA lamps—one lamp can be in use while the other is being pre-warmed

### Typical detection limits achieved using UltraAA lamps

Element	Wavelength (nm)	Slit Width (nm)	Detection Limit (3 sigma)	
			Conventional lamp (µg/L)	UltraAA lamp (µg/L)
As	193.7	0.5	1.4	0.25
Pb	283.3	0.5	0.8	0.20
Se	196.0	1.0	1.1	0.30



## High productivity vapor generation

The ETC-60 enhances productivity of hydride generation AA by providing unattended, flameless atomization of the hydride elements.



### High sample throughput

Varian's fully automated, modular VGA-77 (Vapor Generation Accessory) is ideal for rapid trace level analyses of mercury (using the proven cold vapor technique) and other hydride forming elements at part per billion ( $\mu\text{g/L}$ ) concentrations. The VGA-77 offers:

- Maximum sensitivity
- High sample throughput of up to 70 samples per hour
- Excellent precision of 1-2% RSD
- Low sample consumption of less than 8 mL per element during analysis
- Modular construction for rapid changeover and reduced contamination when switching between elements with conflicting chemistries

### Advantages of Continuous Flow Vapor Generation

The continuous flow VGA-77 offers the following advantages over competitive techniques, such as Flow Injection:

- Maximum sensitivity
- Enhanced precision—the VGA-77 produces a steady state signal, which can be measured using integration. Flow Injection produces transient signals, requiring multiple injections for precise results.

- Greater productivity—results are obtained using the VGA-77 in less than a minute

- Simple and automatic operation—each sample is automatically combined with a continuous flow of acid and reagents

### Unattended hydride analysis

For even greater productivity, or increased sensitivity from the vapor technique, combine the VGA-77 with Varian's SPS-5 autosampler and ETC-60 Electrothermal Temperature Controller. The ETC-60 is an electrically heated quartz cell, which eliminates flame heating of the atomization cell, enabling safe, unattended, flameless hydride analyses.

The lower atomization temperatures used with the ETC-60 (typically  $<1000\text{ }^{\circ}\text{C}$ ) increase sensitivity by up to 30%, ensuring sub  $\mu\text{g/L}$  detection limits are achieved.





### Reducing the cost of ownership

The SpectrAA series were designed with cost of ownership in mind. The easy-to-use software will minimize training and get your lab up and running faster.

For protection in dusty or corrosive environments, the optics are completely sealed and all mirrors are quartz overcoated for long term, stable performance. When connected to a supply of clean, dry air, the internal air purge ensures total protection from attack in corrosive, humid or dust-filled environments.

Comprehensive diagnostics assist rapid trouble shooting and fault diagnosis, maximizing instrument uptime.

Varian's Telediagnosics option connects you to our worldwide network of support personnel for on-line assistance. This remote diagnosis service minimizes on-site calls and reduces down-time. Telediagnosics also gives you the freedom to access your data at any time. You can view the progress of your analysis from your home, exchange methods or results with other users or connect to other laboratories in your company.

### GLP Compliance and Validation

The SpectrAA software complies with many international standards for Good Laboratory Practice (GLP). If you need to validate your SpectrAA system, Validation documentation is available for SpectrAA instruments, software and accessories. Varian, Inc. service organizations around the world support validation of our instruments in a number of ways, including training programs, support agreements, hotlines, Telediagnosics, service contracts and certification. An overview of the Validation documentation and services Varian, Inc. provides is available from your local Varian, Inc. office.



### Safety

It is Varian's policy to manufacture safe products and to meet all legal requirements governing the design, manufacture and sale of safe products. As with all similar products, the following hazards may be present: high temperatures, high pressure gases, explosive gases, UV and visible light and electricity. Each product is designed to protect operators from potential hazards.

Varian, Inc. supplies instructions that describe the correct procedures for the operation and maintenance of each product.

For clarity, some images in this brochure may depict the spectrometer being used without safety covers. Ensure all safety covers, chimney etc. are in place for normal operation.

SpectrAA atomic absorption spectrometers are designed to determine the concentrations of trace and major elements in solution.

### World Wide Web

Varian's home page <http://www.varianinc.com> is another part of our on-going commitment to customer support. You can access application notes, newsletters and updates about latest product developments or you can email us if you have a question. Use our on-line Parts and Supplies catalog to identify any consumables you need. Immediate access to information, applications support and technical service is never more than a mouse click, or a phone call away.

**CE** The SpectrAA series instruments are certified to comply with the requirements of the EMC and LV directives of the European Union.



Varian is committed to a process of continuous improvement which demands that we understand and then meet or exceed the needs and expectations of our customers—both inside and outside the company—in everything we do.



Varian Analytical Instruments, serving worldwide markets in:

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 Biotechnology  
 Clinical  
 Electronics  
 Environmental  
 Photonics  
 Toxicology  
 Pharmaceutical  
 Food and Beverage  
 Metals and Mining  
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