UP213 is the latest generation, high-performance Nd:YAG deep UV (213nm) laser ablation system that provides flat craters and high absorption for the analysis of opaque and transparent materials alike. The 213nm wavelength produces a finer particle distribution than longer wavelengths, which results in higher transport efficiency of the aerosol leading to better sensitivity, precision and reduced fractionation.

The UP213 combines the ease-of-use and low cost of ownership of a solid-state laser with the high coupling efficiency of the deep UV wavelength for solid sampling of any material. The class-leading software provides complete control of all laser parameters, multi-experiment programming, sample viewing, stage positioning, gas routing functions and two-way triggering of the ICP-MS for a fully automated ablation process.

The UP213 utilises the state-of-the-art Tempest 213nm laser, specifically manufactured by New Wave Research to have all the characteristics necessary for laser ablation. The laser has been engineered so that the beam from the fundamental (1064nm) to the final (213nm) output is completely flat-topped for the flattest craters at the sample surface.

UP213 Advantages

- Higher absorption rate at 213nm improves ablation of all materials, including fragile and easily fractured minerals.
- Unique “true” aperture imaging capability of a truly flat laser beam for the sharpest crater edges at all spot sizes.
- Tempest 213nm engineered by New Wave Research specifically for the UP213 to have the flattest beam profile. Makes analysis of thin films simple and accurate.
- Precision depth profiling and spot sizes down to 4µm make this an excellent tool for fluid inclusion analysis.
- 13 “true” aperture imaged spot sizes.
- Finer particle distribution improves transport efficiency and minimises surface deposits at the ablation site.
The UP213 is controlled via New Wave Research’s market leading software. High versatility and user-friendliness combined with many new features and the most powerful laser to ICP-MS interface available.

New Wave Research is proud to have the most user-friendly and versatile software package available today for control of the UP213 laser ablation system. The latest version is available free of charge at www.new-wave.com/nwrsupport.htm.

Recently Added Features

- Adjustment of internal mass flow controllers* during experiments for easier tuning.
- Full compatibility with the new Large Format Cell.†
- Beziér curve scan function facilitating easy tracking of growth bands and features (Fig. 1)
- Drag-and-drop sequence editing of scan patterns—makes setting up long analytical runs easy.
- Visible cut path shows total area to be removed prior to ablation (Fig 2).
- Plasma protection with gas valve warning system.
- Staged ramping of internal mass flow controllers and intelligent valve switching prevents plasma blowout.
- Grouped amendment of scan pattern properties.
- Merge line scans into a single scan pattern.
- Continuous z-focus during depth profiling for constant fluence at the point of ablation.
- Compatible with Windows Vista

Existing Features of LA Software

- The most versatile ICP-MS triggering software available; Trigger In and Sync Out modes for compatibility with all ICP-MS/ICP-OES systems.
- Powerful automation and manipulation of programmed experiments.
- Auto-scrolling of stages makes placing large experiments a one-step, simple process.
- 3D re-coordination of saved experiments. Go back to a sample months later without having to reprogram pattern scans.
- Mapping tool allows macro view and navigation of the whole sample—range is limited only by sample cell dimensions.
- 13 aperture imaged software-controlled spot sizes.
- Automatic Bypass/Purge/Online gas valve control.
- Duplicate, rotate and translate scans about multiple centres for rapid reconfiguration of experiments.
- Optional off-line pre-ablation with separately programmable parameters for sample cleaning and surface preparation.

Figure 1. The new Beziér curve function allows easy tracking of mineral boundaries and growth bands.

Figure 2. The new Pattern Cut Width function clearly shows the area to be ablated.
Geological

Laser ablation is now common in Geology labs world-wide for applications ranging from Pb isotope ratio dating of minerals (below) to fluid inclusion studies. Studies also include U/Pb, Sr/Sr isotope ratios and the new Os/Re chronometer.

Biomedical - Mapping of Tissues

Biomedical studies of tissue require greater resolution of chemical elements and proteins than ever before in order to identify diseased states. The diagram below shows a 2D mapping experiment of ABeta protein (labelled with $^{153}$Eu) and chemical elements in a section of brain tissue made using a UP213.

Archaeological - Restoration of a Fresco

A UP213 was used to analyse a cross section of ancient gilded fresco in a Slovenian church roof in order to identify the original materials used prior to restoration.
# UP213—Specifications

## Performance

<table>
<thead>
<tr>
<th>Laser</th>
<th>Tempest 213nm 20Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength</td>
<td>5th Harmonic @ 213nm</td>
</tr>
<tr>
<td>Pulse Duration</td>
<td>&lt; 4ns</td>
</tr>
<tr>
<td>Repetition Rate</td>
<td>1 to 20Hz</td>
</tr>
<tr>
<td>Pulse Stability (1σ)</td>
<td>3%</td>
</tr>
<tr>
<td>Energy Control</td>
<td>Optically attenuated at 1064nm for best stability</td>
</tr>
<tr>
<td>Energy @ Sample Surface</td>
<td>&gt; 3 mJ</td>
</tr>
<tr>
<td>Fluence @ Sample Surface</td>
<td>&gt; 30 J/cm²</td>
</tr>
<tr>
<td>Spot Selection—Aperture Imaged Mode</td>
<td>13 true aperture imaged, software-controlled spots: 4µm to 110µm</td>
</tr>
<tr>
<td>Spot Selection—Focus Beam Mode*</td>
<td>Software-controlled motorised beam expander: 2µm to 300µm</td>
</tr>
</tbody>
</table>

## Beam Conditioning

- Flat beam profile at fundamental output
- Bi-directional control between ICP-MS and UP213 for maximum control of experiments

## X-Y Stages

- 52mm x 52mm travel; 1 µm resolution

## Z Stages

- 25mm travel; 1 µm resolution

## Stage Configuration

- Open architecture with viewing shield, no enclosure

## Sample chamber

- Quick-change drawer; 60mm ID, 50mm deep
- Upgradeable chamber options include CryoCell, SuperCell, Large Format Cell, Paper Cell

## Sample Mapping

- Mosaic sample mapping across the entire sample area

## Auto-sampling

- Continuous sequential analysis of an unlimited number of scans—limits operator time

## Confocal Colour Video Microscope and Camera

- 2µm feature resolution with colour CCD camera. Sample is in focus for all laser spot sizes

## Optical Magnification

- Computer controlled motorised variable zoom with 5.6X to 36X optical magnification

## Lighting

- Software-controlled coaxial, ring and transmitted lighting

## Polarisers

- Rotating cross-polarisers as standard

## Gas Handling

- Software-controlled solenoid valves—purge, bypass and online

## General

<table>
<thead>
<tr>
<th>Safety Classification</th>
<th>Fully interlocked, Class 1 system as standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete System Size</td>
<td>Length 25&quot; (64cm), Width 18&quot; (46cm), Height 22&quot; (56cm)</td>
</tr>
<tr>
<td>Complete System Weight</td>
<td>UP 130lbs (59kg), Power Supply 30lbs (13.6kg)</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>UP 100-110V (AC), 3A, 50/60Hz; Power Supply 100-110V (AC), 3A, 50/60Hz</td>
</tr>
<tr>
<td></td>
<td>UP 220-240V (AC), 3A, 50/60Hz; Power Supply 220-240V (AC), 3A, 50/60Hz</td>
</tr>
<tr>
<td>Warranty</td>
<td>12 Months or 30M shots as standard</td>
</tr>
</tbody>
</table>

## Options

### Trinocular Microscope

- Nikon microscope head with 15X eyepieces—fully interlocked for safe viewing

### Auto-Focus

- Diode laser-based auto focussing of Z-axis

### Internal Mass Flow Controller

- Software-controlled fully-integrated mass flow controller

### Auto-Switchable

- Software-controlled motorised beam expander in addition to aperture-imaged spots for greater spot size control (range 2µm to 330µm)

### Alternate Sample Cells

- SuperCell™, Large Format Cell, CryoCell, Paper Cell

### Service Contract

- Extended 12 month warranty and service contracts available

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