

**MALDI-7090**  
MALDI Mass Spectrometer

**TrueClean: Novel Automated UV Laser-based  
MALDI TOF-TOF Source Cleaning for the MALDI-7090**

**Introduction**

In many life science applications there is a growing requirement for high-throughput MALDI TOF-TOF mass spectrometers. This can now be realized through the introduction of the MALDI-7090™ high resolution MALDI TOF-TOF mass spectrometer, which is capable of running at laser repetition rates of 2 kHz in MS and MS/MS acquisition modes.

During the MALDI process, a plume of analyte and matrix molecules is formed through UV laser irradiation. The ionized molecules are accelerated into the time-of-flight analyzer region through apertures in the source electrodes by an electric field formed between the electrodes. However, some of the matrix material and analyte is not ionized and this neutral plume continues to expand from the sample spot until it is deposited on surfaces in the vicinity of the ion source.

Over time the contamination can build up until an insulating layer is formed that charges up and adversely affects the operation of the ion source. Although the MALDI-7090 is equipped with unique wide-bore ion optics which help to minimize this process, at some point the source electrodes must be cleaned. In a high-throughput environment it becomes impractical to vent the instrument every time the source needs cleaning.

The MALDI-7090 ion source incorporates TrueClean™, a completely new and unique method of source cleaning that has been designed to effectively and automatically remove contamination from source electrodes. This patented method exploits the fact that most of the contamination on the electrodes was originally desorbed from the sample spot using UV laser irradiation and thus will be readily desorbed from the electrodes if it is again irradiated with UV light of sufficient energy density.

**Key features and benefits of this design are:**

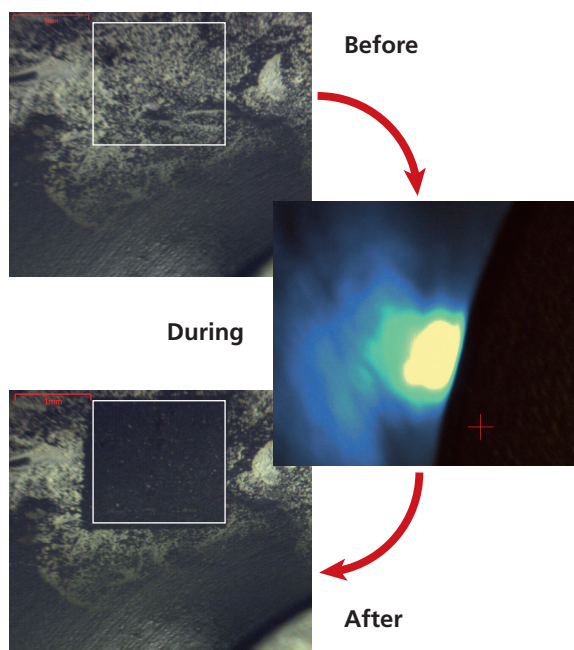
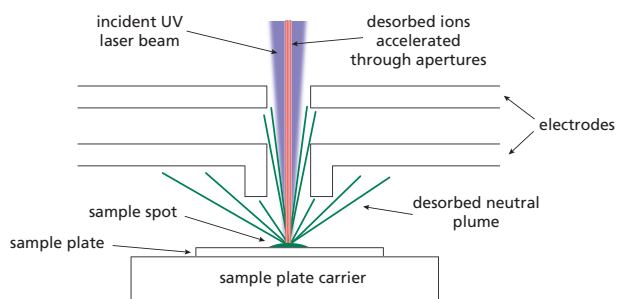
- The use of integrated scanning reflective optics to direct and refocus the output of the MALDI UV laser (already employed in the instrument), onto the contamination to be removed
- Very effective and rapid desorption of the material from the ion optics surface
- Fully automatic efficient source electrode cleaning without the need for source removal or venting
- Avoids significant heating of the electrodes or the use of a second (IR) laser, thus preventing shortcomings associated with earlier techniques



### MALDI-7090: Standard acquisition configuration

In the standard configuration, the UV laser beam is directed through the large aperture ion optics onto the MALDI sample plate at near-normal incidence.

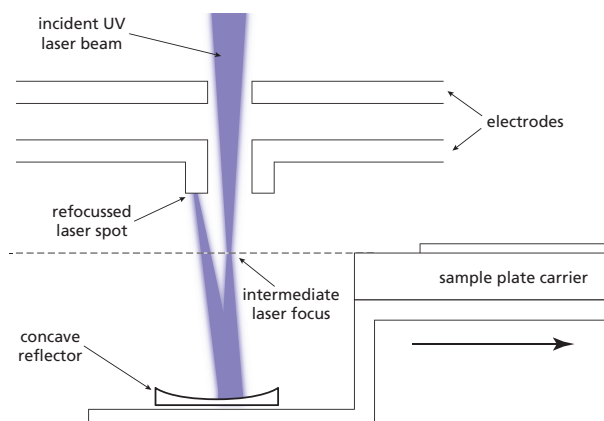
The plate is imaged using a high-definition colour camera using high resolution diffraction limited optics. Furthermore, wide aperture optics help to provide an enhanced image of the sample spot.



Example of an area cleaned using TrueClean

### MALDI-7090: Electrode cleaning configuration

TrueClean source cleaning configuration is initiated by moving the sample stage and positioning a concave reflector (mirror) close to the ion optic axis. Appropriate adjustment of the laser optics shifts the laser focus such that the beam is directed and refocused close to the surface of the contaminated electrode by the mirror. The focus is optimized to give sufficient energy density to desorb the contamination whilst maximizing the area cleaned. The beam is readily scanned across the electrode by translating the mirror in the horizontal plane.



### Conclusion

TrueClean provides rapid and very efficient cleaning of the electrodes of MALDI-7090 ion source, without the need for removing the source or venting the sample analysis chamber.

The method has been found to be effective in cleaning all common MALDI matrices from electrodes even when an appreciable layer of contaminant material has been allowed to build up.