

ultrafleXtreme: Redefining MALDI-TOF-TOF Mass Spectrometry Performance

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The new ultrafleXtreme exceeds any current expectations on MALDI-TOF-TOF technology: A proprietary kHz smartbeam-II MALDI laser integrated with a novel FlashDetector and electronics makes it the only MALDI-TOF-TOF on the market to provide kHz acquisition in MS and MS-MS modes. It generates a new level of data quality in applications such as LC-MALDI proteomics, high resolution tissue imaging based biomarker discovery or top-down sequencing.

Introduction

Advanced electronic engineering, the unique FlashDetector combined with 4 GHz digitization rate at full spectra length and "panoramic" PAN technology provide

highest resolving power >40000 across the peptide mass range (Figure 1) and beyond (Figure 2). This leads directly to more identified proteins in LC-MALDI applications at improved specificity.

Figure 1: ultrafleXtreme delivers mass accuracy <1 ppm and superb resolving power >40000 simultaneously across the proteomics mass range because of its patented PAN technology.

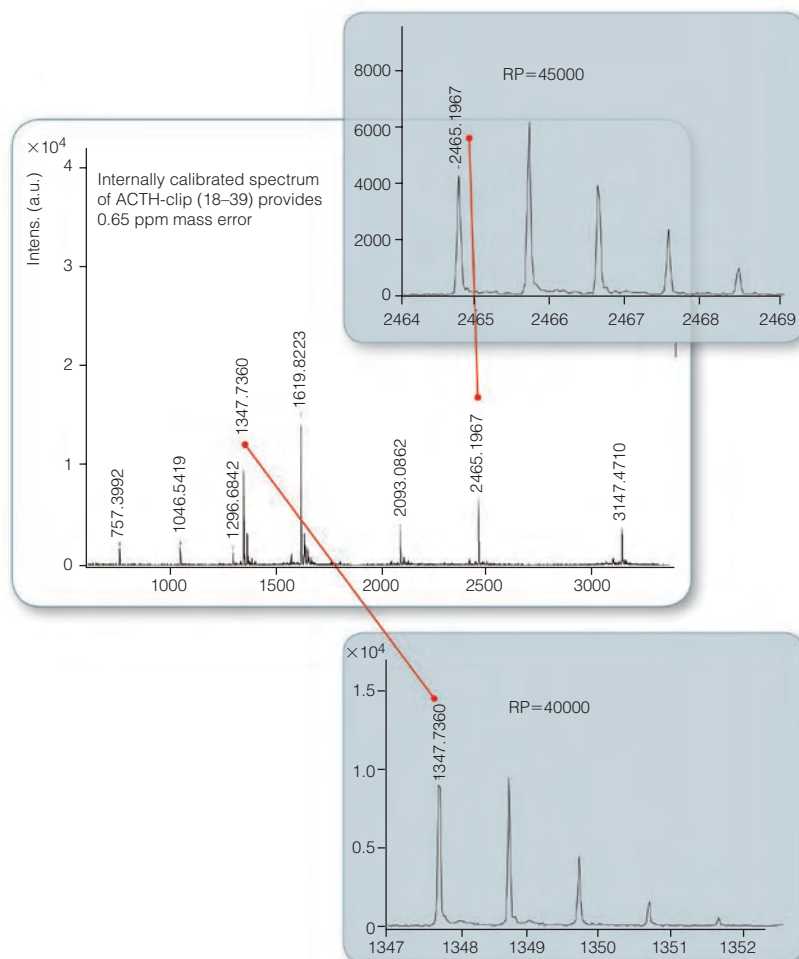


Figure 2: ultrafleXtreme provides isotopic resolution even for intact proteins at 12 kDa (here: cytochrome c).

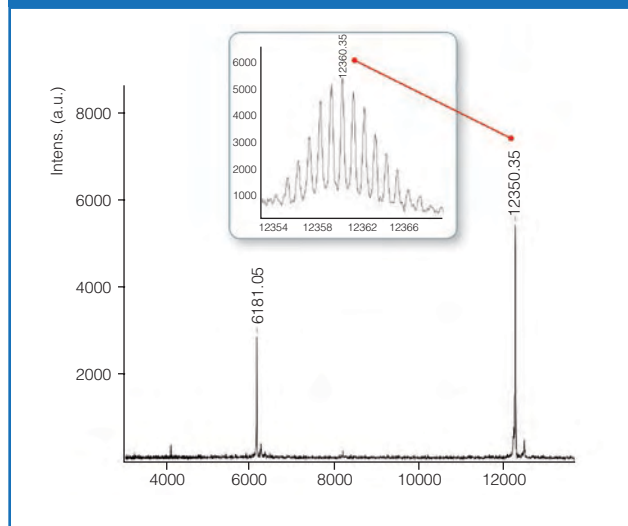
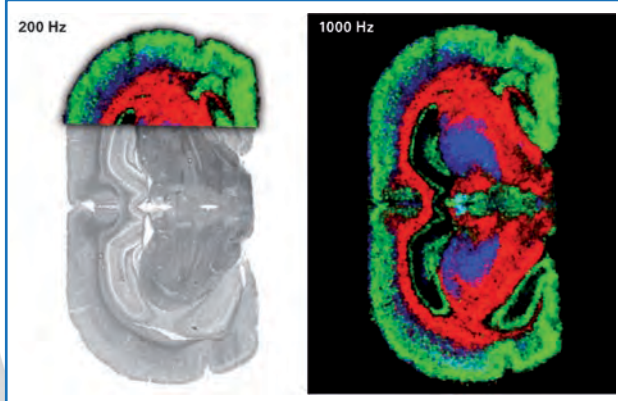


Figure 3: kHz acquisition on ultrafleXtreme (right) with 2 pixel/sec vs. classical 200 Hz acquisition (left). Within the same data acquisition time, now a full image of the mouse brain can be obtained. Sample: mouse brain selections with 10 μ m thickness. MALDI image overlaid to scanned tissue image after identical acquisition time.



The Ultimate Tissue Imaging Technology

The proprietary smartbeam-II laser with 1000 Hz repetition rate was specifically developed for the ultrafleXtreme MALDI-TOF-TOF. The software allows operating with 1 to 1000 Hz repetition frequency in MS as well as in MS-MS mode. Therefore, kHz data acquisition of high resolution tissue protein images and LC-MALDI analysis in Biomarker workflows are both perfectly sustained on the ultrafleXtreme. Compared to former instruments a full tissue analysis nowadays can be performed within the same data acquisition time, (Figure 3).

In addition, the optimized smartbeam-II laser delivers constant high output energy-independent of the selected repetition frequency across long acquisition runs. This is indispensable for series of MALDI imaging or LC-MALDI runs.

A computer-controlled variable laser focus diameter of 10–100 μ m permits new level spatial resolution — essential for emerging applications such as high resolution MALDI tissue imaging. Achieve incredible spatial resolution with no loss of protein signal intensity.

MALDI Perpetual Ion Source with Laser-cleaning in Minutes

An entirely new design for removal of sample and matrix debris is implemented in the MALDI Perpetual ion source. Its push-button, laser-cleaning concept is mandatory for kHz operation — and it works for all MALDI matrices. This self-cleaning ion optics are ready for the next run within a few minutes.

Market-leading Technology

The combination of technologies implemented results in unmatched performance and productivity of the ultrafleXtreme MALDI-TOF-TOF:

- Patented 1 kHz smartbeam-II laser provides focus diameters down to 10 μ m for high resolution imaging near the single cell level, at constant signal intensity even at small focus diameters.
- 1 kHz electronics engineered with precision high voltage control brings the laser performance to a true systems performance for all operational modes. From protein tissue

imaging to LC-MALDI proteomics work, all fully enabled at 1–1000 Hz data acquisition rate for both TOF and TOF-TOF operation.

- PAN technology for high mass accuracy and resolution across a wide mass range, for precision proteomics and Top-Down protein sequencing in recombinant protein work.
- The new FlashDetector provides unmatched mass resolution and accuracy.
- The new 4 GHz digitizer, provides unmatched system performance.
- The self-cleaning MALDI Perpetual ion source complements the suite of innovations ensuring robust operation.

Conclusion

Now, with the launch of the ultrafleXtreme, a major step forward in MALDI-TOF-TOF systems has arrived. The new ultrafleXtreme exceeds the capabilities of existing systems by a wide margin. Along with being easy to use and simple to maintain, the ultrafleXtreme delivers unmatched speed, high performance in MS and MS-MS modes, and efficiently provides the full power and flexibility of MALDI-TOF-TOF for a wide range of applications.

References

1. Bruker Technical Note TN-15.
2. A. Holle et al., *J. Mass Spectrom.*, **41**, 705–716 (2006).
3. Bruker Technical Note TN-32.

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