

Pushing toward next generation Ion-Trap-MS: consequent adoption of newest technology in ion formation, transfer and trapping

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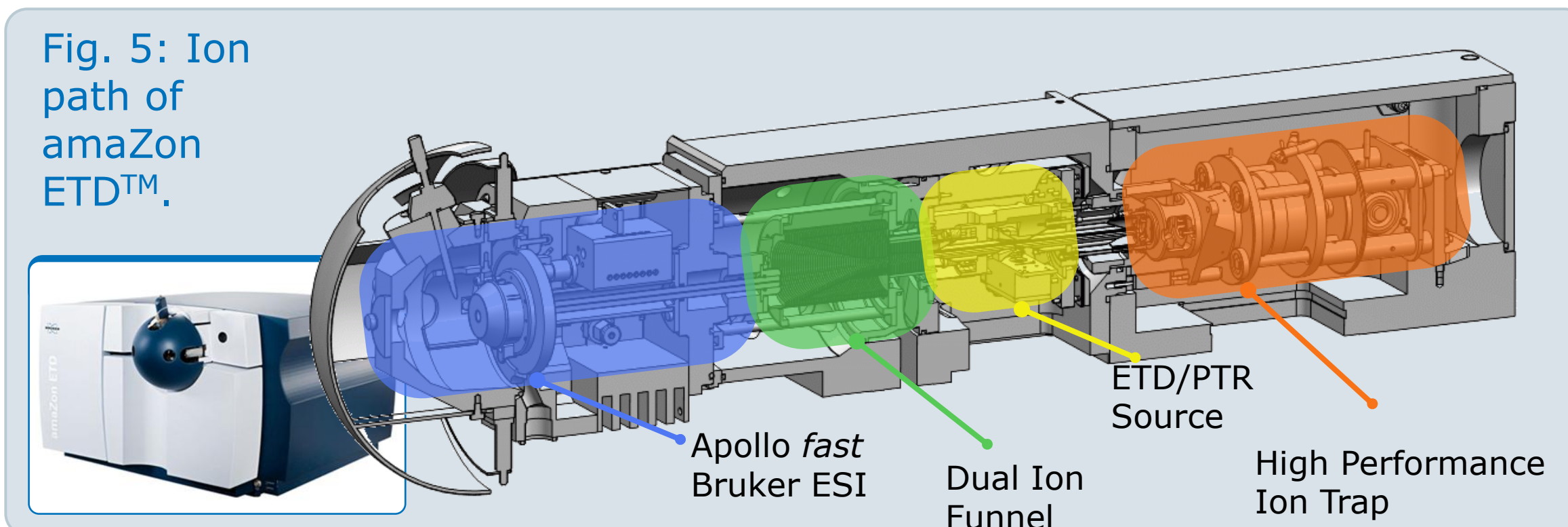
Introduction

Ion-Trap MS are well established work-horses for a wide range of analytical application. Achieving significant improvements in system performance requires simultaneous enhancements in ion formation, ion transfer and ion trapping and activation. The presented new generation of amaZon Ion-Traps incorporates advancements in the related performance factors: speed, sensitivity and resolution.

Methods

- The Desolvation Stage has been redesigned to achieve efficient analyte desolvation, direct, fast potential control and high ion yield
- A Dual stage, narrow spaced, large volume Ion-Funnel has been introduced for extra high ion acceptance and wide mass transmission profile characteristic
- The High Performance Ion-Trap Analyser has been equipped with an additional separation and conditioning stage for better control of buffer-gas composition and injection

Fig. 5: Ion path of amaZon ETD™.



Results

- The new desolvation stage allows performing polarity switching without the need of additional stabilization delays
- 20 Hz MS acquisition rate can be achieved in alternating polarity mode (Fig. 2)

Ion Signal Dependence on Dual Ion Funnel RF Amplitude: One Set Value for all Masses

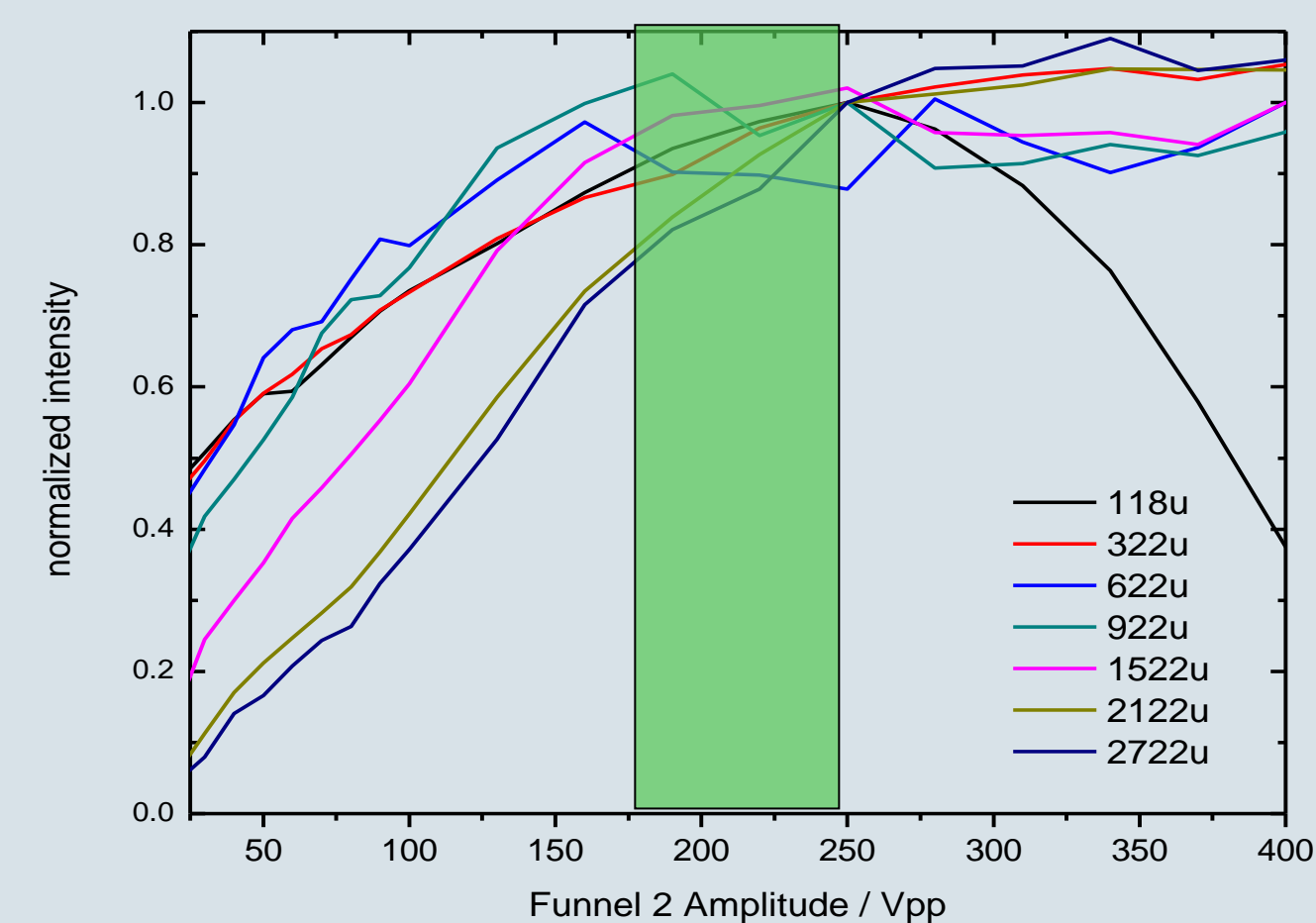


Fig. 1: Evaluation of the mass transmission profile of the dual ion funnel: ion signal intensity is independent of the funnel amplitudes for a wide m/z range.

- 10 x sensitivity gain in MS/MS on Reserpine, shifting limits below 50 fg (Fig. 6)
- Isotopic resolution (FWHM < 0,5 Th) in XtremeScan mode at 52,000 Th/s (Fig. 3)
- Resolving 6-fold charged protein fragments in full scan operation with resolution R = 21,500 at m/z 2850 Th (Fig. 4)

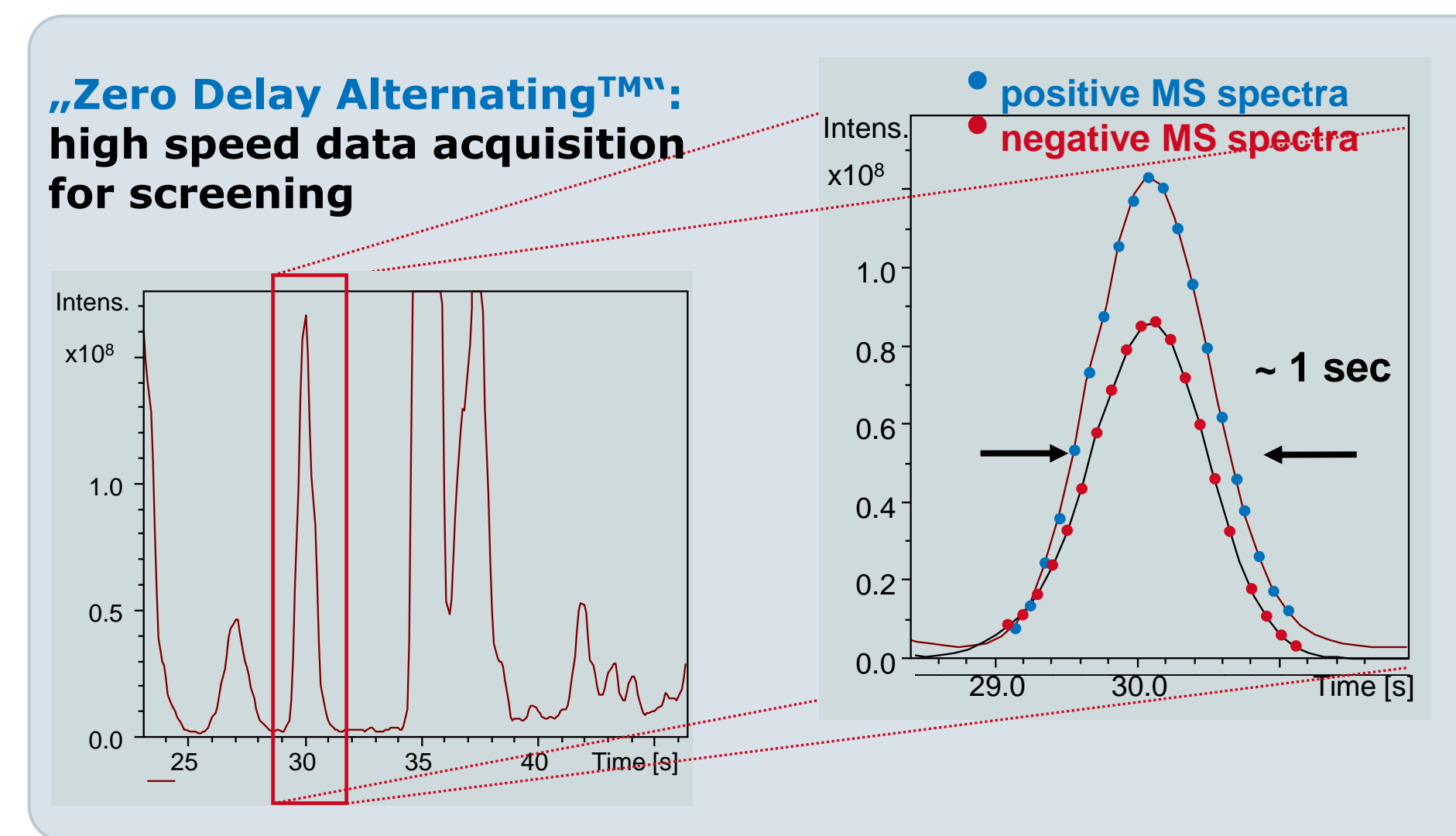


Fig. 2: UHPLC separation of compounds in plasma, typical peak width ~1 sec (FWHM): 20 Hz MS acquisition rate in alternating polarity modes.

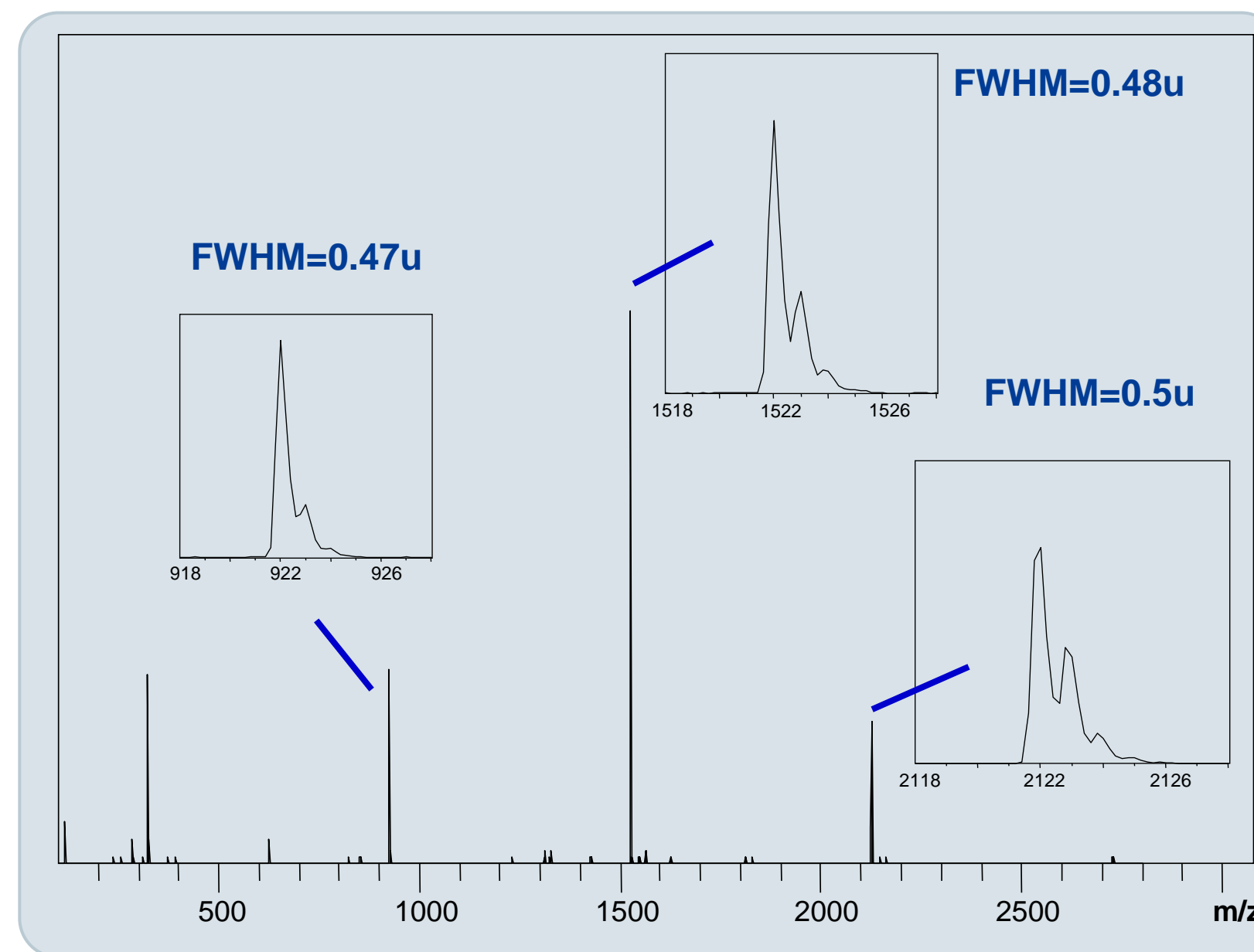


Fig. 3: Better than unit-resolution in XtremeScan mode at a scan speed of 52,000 u/s.

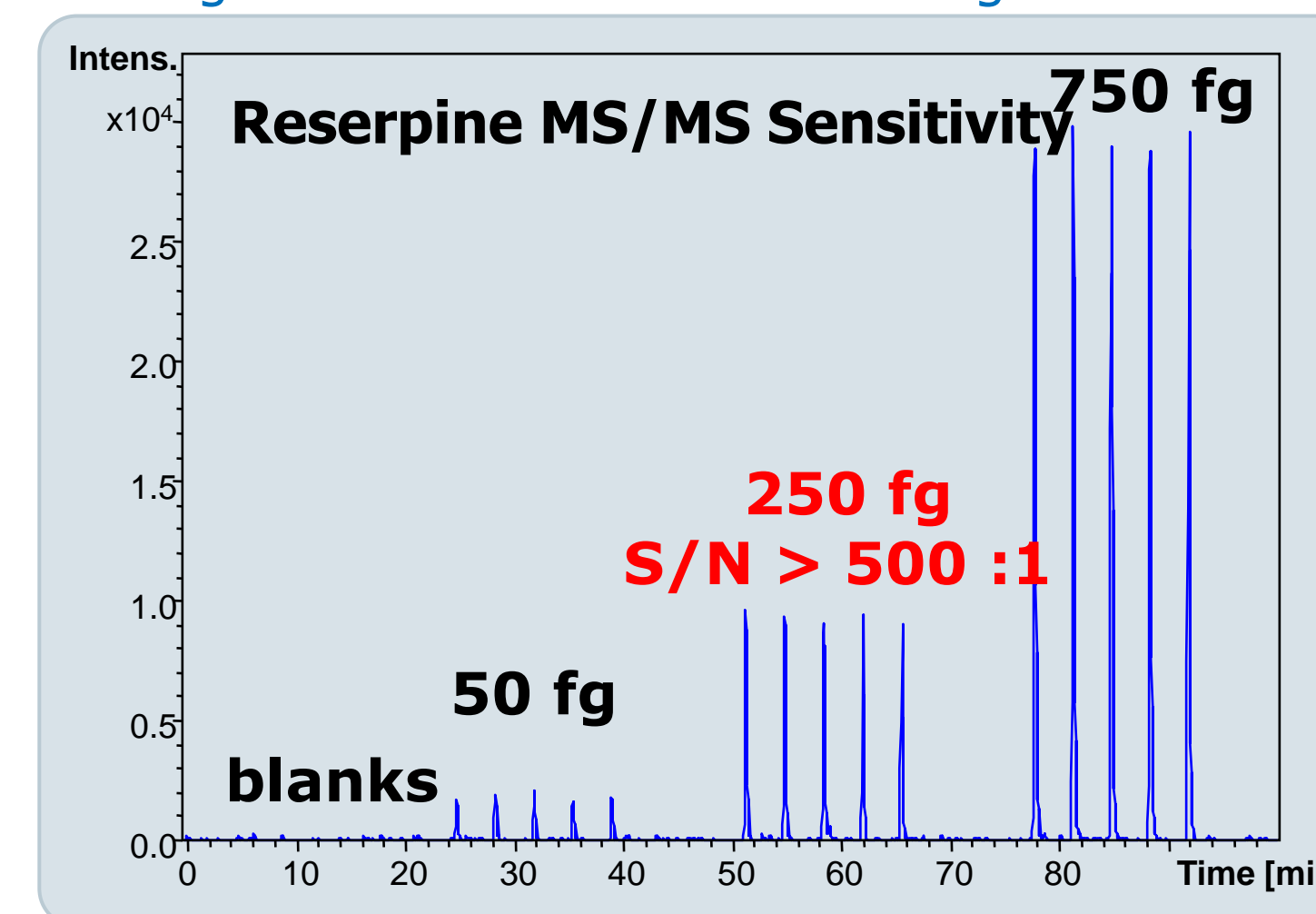


Fig. 6: 10 x Sensitivity improvement in MS/MS for Reserpine. S/N > 500:1 at 250 fg Reserpine injected. Robust signal even at amounts of 50 fg.

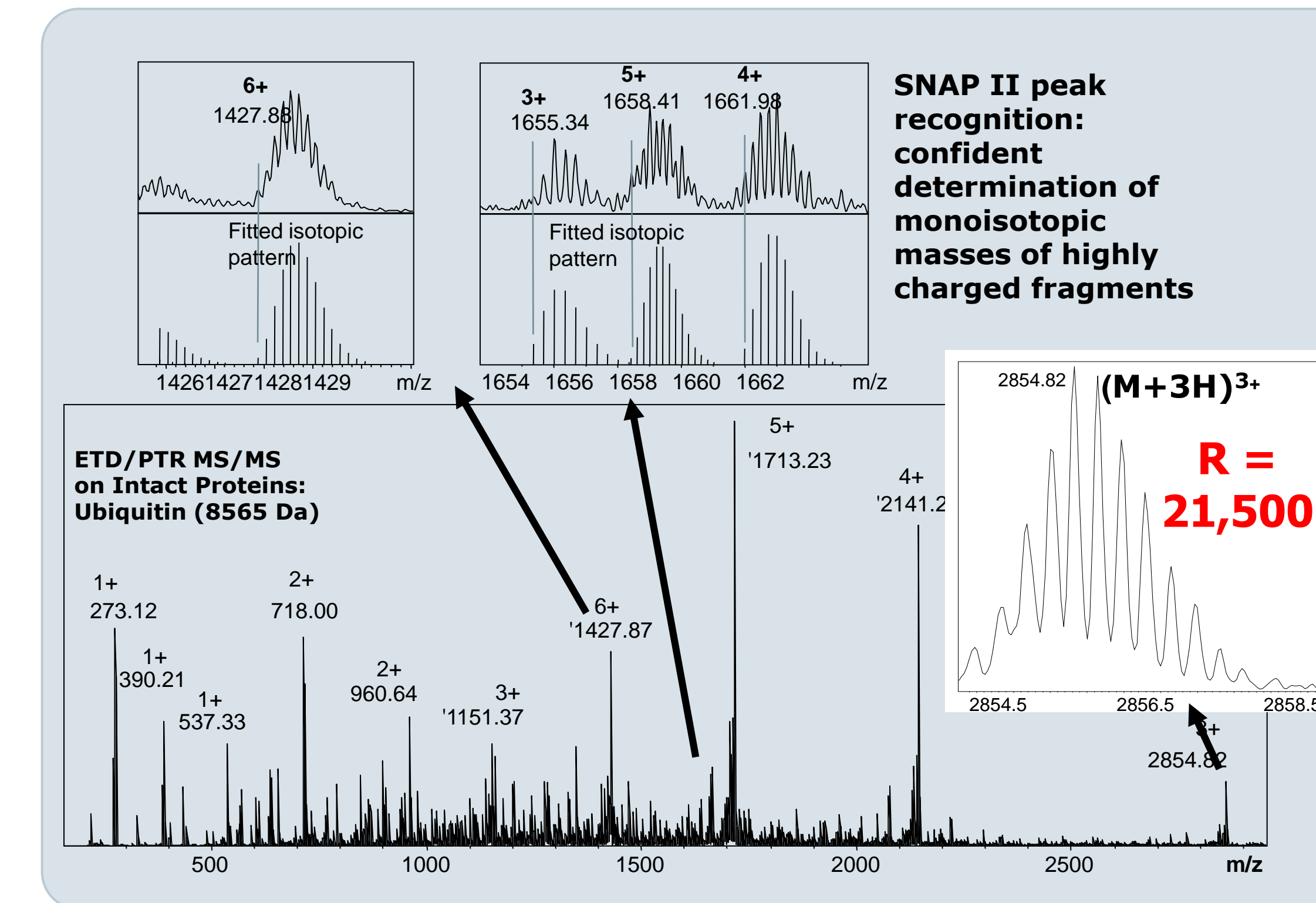


Fig. 4: Highest resolution in full scan mode! Resolving even 6-fold charged ions. Resolution R > 21,500 at 3000 m/z.

Conclusions

- The amaZon Ion-Trap MS reaches new levels in speed, sensitivity and resolution
- 10x higher sensitivity is ideally suited for bottom up analysis of complex protein samples (compare HUPO poster A143)
- Most sensitive, robust and easy-to-use ETD/PTR setup
- Ion Traps are the most versatile instruments for proteomics